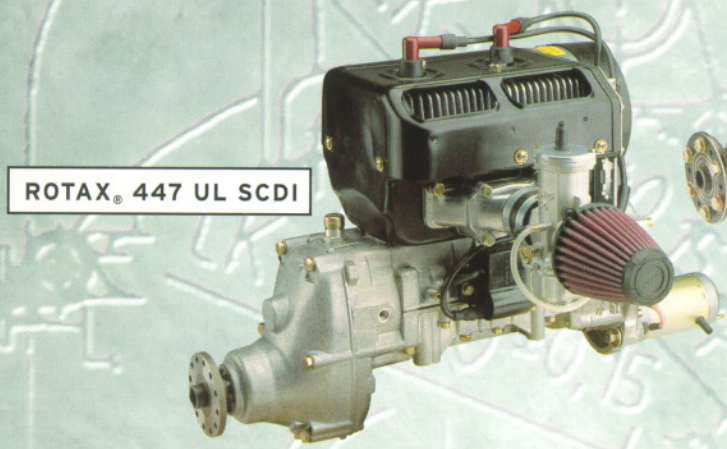
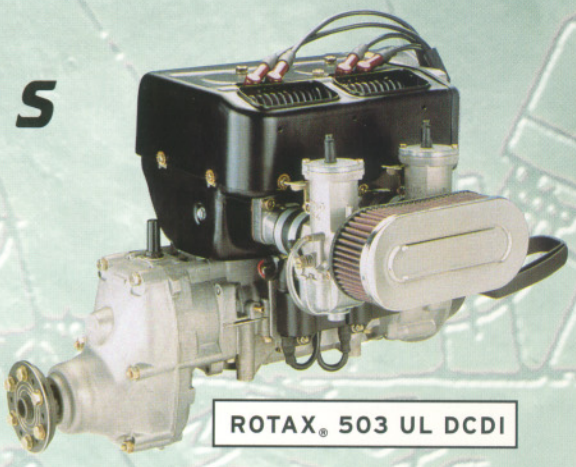
The Sky is the Limit.SM

ROTAX®
AIRCRAFT ENGINES

Installation Manual for Engine Types



ROTAX® 447 UL SCDI



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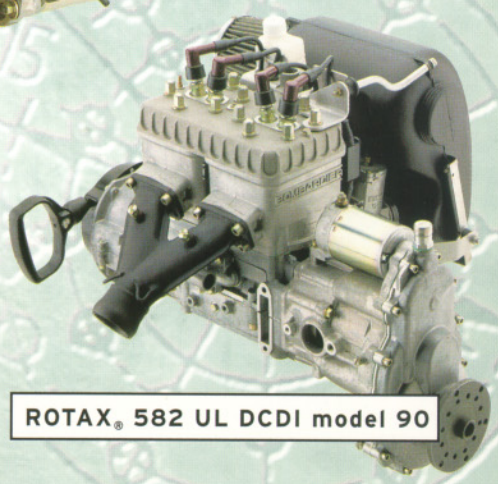
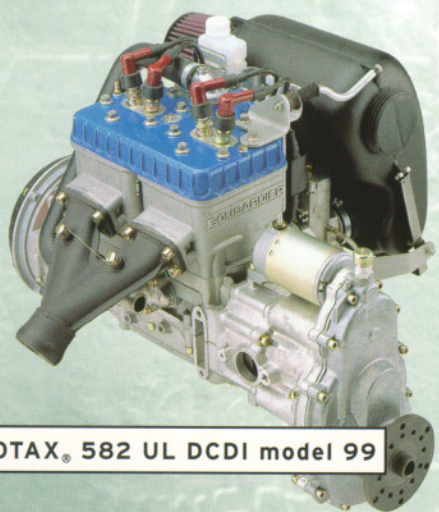


ROTAX® 582 UL DCDI model 90



ROTAX® 582 UL DCDI model 99

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⚠ WARNING

Before starting with engine installation, please, read the Installation Manual completely as it contains important safety relevant information.

Approval of translation to best knowledge and judgement - in any case the original text in German language is authoritative.

Edition: 0 of 1999 05 01

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ROTAX® part no.: 899.482

0) Preface

Congratulation on your decision to use a ROTAX® aircraft engine.

Before starting with the engine installation, read this Installation Manual carefully. The Manual will provide you with basic information on correct engine installation, a requirement for safe engine operation.

If any passages of the Manual are not completely understood or in case of questions, please, contact an authorized Distribution- or Service Partner for ROTAX® engines.

0.1) Remarks

This Installation Manual is to familiarize the owner/user of this aircraft engine with basic installation instructions and safety information.

For more detailed information on operation, maintenance, safety or flight, consult the documentation provided by the aircraft builder and dealer.

For further information on maintenance and spare part service contact the nearest ROTAX® distributor (see chapter of Service Partners).

0.2) Engine serial number

On all enquiries or spare parts orders, always indicate the engine serial number, as the manufacturer makes modifications to the engine for further development.

The engine serial number is on the top of the crankcase, magneto side, or ignition cover.

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1) Safety

Although the mere reading of such an instruction does not eliminate a hazard, the understanding and application of the information will promote correct use.

The information and components-/system descriptions contained in this Maintenance Manual are correct at the time of publication. ROTAX®, however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on its products previously manufactured.

ROTAX® reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

The figures in this Maintenance Manual show the typical construction. They may not represent in full detail or the exact shape of the parts which have the same or similar function.

Specifications are given in the SI metric system with the USA equivalent in parenthesis. Where precise accuracy is not required, some conversions are rounded off for easier use.

1.1) Repeating symbols

This Manual uses the following symbols to emphasize particular information. These indications are important and must be respected.

▲ **WARNING: Identifies an instruction which, if not followed, may cause serious injury including the possibility of death.**

■ **ATTENTION: Denotes an instruction which, if not followed, may severely damage the engine or other component.**

◆ **NOTE: Indicates supplementary information which may be needed to fully complete or understand an instruction.**

1.2) Safety information

▲ WARNING: This engine, by its design, is subject to sudden stoppage. Engine stoppage can result in forced landings, no power landings or crash landings. Such crash landings can lead to serious bodily injury or death.

▲ WARNING: Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, of other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage.

Aircraft equipped with this engine must only fly in DAYLIGHT VFR conditions.

▲ WARNING: This is not a certificated aircraft engine. It has not received any safety or durability testing, and conforms to no aircraft standards. It is for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety.

User assumes all risk of use, and acknowledges by his use that he knows this engine is subject to sudden stoppage.

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- It should be clearly understood that the choice, selection and use *of this* particular engine on any aircraft is at the sole discretion and responsibility of the aircraft manufacturer, assembler and owner/user.
- Due to the varying designs, equipment and types of aircraft, ROTAX® makes no warranty or representation on the suitability of its engine's use on any particular aircraft. Further, ROTAX® makes no warranty or representation of this engine's suitability with any other part, component or system which may be selected by the aircraft manufacturer, assembler or user for aircraft application.
- You should be aware that any engine may seize or stall at any time. This could lead to a crash landing and possible severe injury or death. For this reason we recommend strict compliance to the maintenance, operation and any additional information which may be given to you by your dealer.
- Select and use proper aircraft instrumentation. This instrumentation is not included with the ROTAX® engine package. Only approved instrumentation can be installed.
- Unless in a run up area, never run the engine with the propeller turning while on the ground. Do not operate engine if bystanders are close.
- To prevent unauthorized use, never leave the aircraft unattended with the engine running.
- Keep an engine log and respect engine and aircraft maintenance schedules. Keep the engine in top operating condition at all times. Do not operate any aircraft which is not properly maintained or has engine operating irregularities which have not been corrected.
- Keep an engine log and enter any unusual engine behaviour. Do not fly unless you have corrected a given problem and recorded the correction in the log.
- Since special tools and equipment may be required, engine servicing should only be performed by an authorized ROTAX® engine dealer or a qualified trained mechanic approved by the local airworthiness authority.
- To eliminate possible injury or damage, ensure any loose equipment or tools are properly secured before starting the engine.
- Never leave your aircraft or other vehicle unattended while the engine is running. If operated by someone else you could be sued even if the use was unauthorized by you.
- When in storage protect the engine and fuel system from contamination and exposure.
- Never operate the engine and gearbox without sufficient quantities of lubricating oil.
- Periodically verify level of coolant at 582 UL DCDI and 582 UL DCDI mod. 99.
- Never exceed maximum rated rpm. and allow the engine to cool at idle for several minutes before turning off the engine.

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- ☞ Operating the engine at high rpm. at low throttle position, for example during descent, may increase engine and exhaust temperatures and cause critical overheating. Always compensate and match rpm with throttle position.
- ☞ Maintain your engine in top condition and assume it's going to quit running at any time. Leave yourself a way out in the event of unexpected failure.
- ☞ Never mix fuel in an enclosed area, or where fumes could reach an ignition point.
- ☞ Make sure all engine controls are operative, that you know ON and OFF positions of throttle and ignition, that they are easily accessible, and that you can operate them instinctively without hesitation.
- ☞ Never refuel if fuel could be spilled on hot engine components. Use only safety approved fuel containers and never transport fuel in an unsafe manner.
- ☞ Check engine suspension frequently as well as the drive components, fuel lines, wiring, and fuel and air filters.
- ☞ Check for fuel contamination, air vents, etc. Protect engine while not in use from any contamination entering fuel or carburetion system, but be sure to remove storage protection before starting engine.

1.3) Technical documentation

The information given in the

☞ Installation Manual

☞ Operator's Manual

☞ Maintenance Manual

☞ Service Informations

☞ Spare parts list

are based on data and experience that are considered applicable for professionals under normal conditions.

The fast technical progress and variations of installation might render present laws and regulations inapplicable or inadequate.

The illustrations in this Manual are mere sketches and show a typical arrangement. They might not represent the actual part in all its details but depict parts of the same or similar function. Therefore deduction of dimensions or other details from illustrations is not permitted.

All necessary documentation is available from the ROTAX Distribution- and Service Centers (see Chapter 22).

◆ NOTE: The Illustrations in this Operator´s Manual are stored in a graphic data file and are provided with a consecutive irrelevant number.

This number (e.g. 00277) is of no significance for the content.

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5) List of amendments

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0	0÷22	all	99 05 01	not required		99 05 01	AA/HeC

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Currt. no.	Chap-ter	Pages	Date of modification	Note of approval	Date of approval by authority	Date of insertion	Marks / Signature

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6) Description of design

6.1) Designation of type

Refer to latest version of current Operator's Manual 447 UL SCDI- 503 UL DCDI -582 UL-582 UL DCDI mod. 99.

6.2) Standard engine design

Refer to latest version of the current Operator's Manual 447 UL SCDI- 503 UL DCDI -582 UL-582 UL DCDI mod. 99.

Auxiliary equipment

■ ATTENTION: Any equipment not included as part of the standard engine version and thus not a fix component of the engine is not in the scope of supply.

Components especially developed and tested for this engine are readily available at ROTAX®.

▲ WARNING: **This equipment has not been tested for safety and durability to the standards of aviation.** The user assumes all risks possibly arising by utilizing auxiliary equipment.

- ☞ Exhaust system
- ☞ Intake filter
- ☞ Coolant radiator
- ☞ Flydat
- ☞ Electric rev counter
- ☞ Hour-meter

d00316

6.3) Engine components, engine views, numbering of cylinders

See fig. 1, 2 and 3.

PTO power take off side

MS magneto side

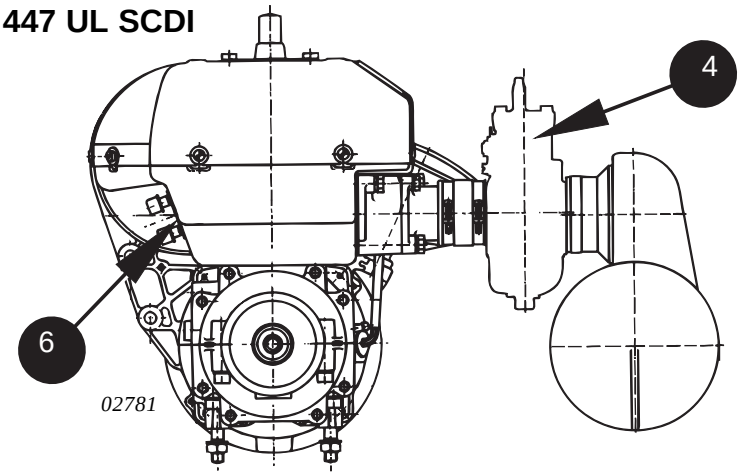
A points of attachment for engine transport

Cyl. 1 cylinder 1

Cyl. 2 cylinder 2

(1) propeller flange
(2) propeller gear box
(3) intake manifold
(4) carburetor
(5) coolant pump
(6) exhaust socket
(7) electric starter
(8) fresh oil lubrication pump
(9) electronic modules of ignition unit
(10) ignition housing

6.3.1) 447 UL SCDI



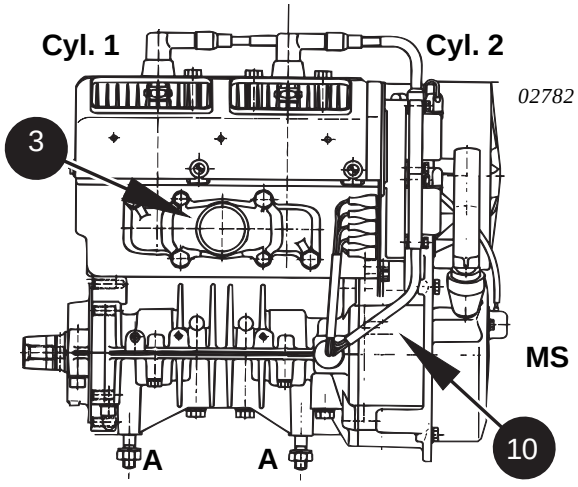


fig. 1

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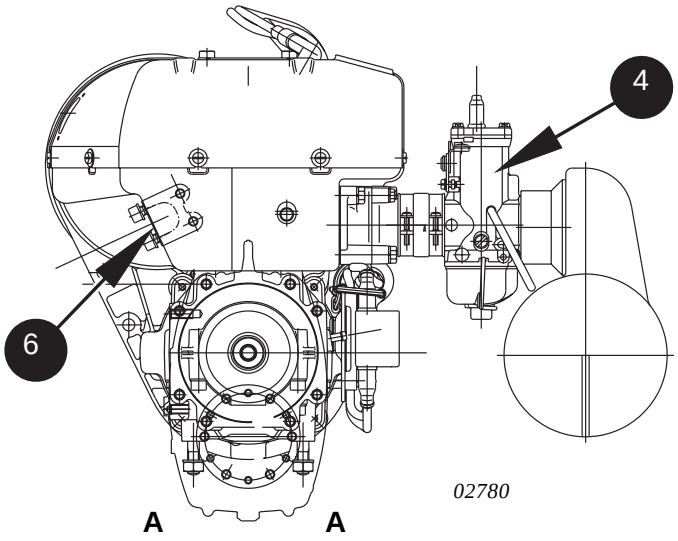
6.3.2) 503 UL DCDI



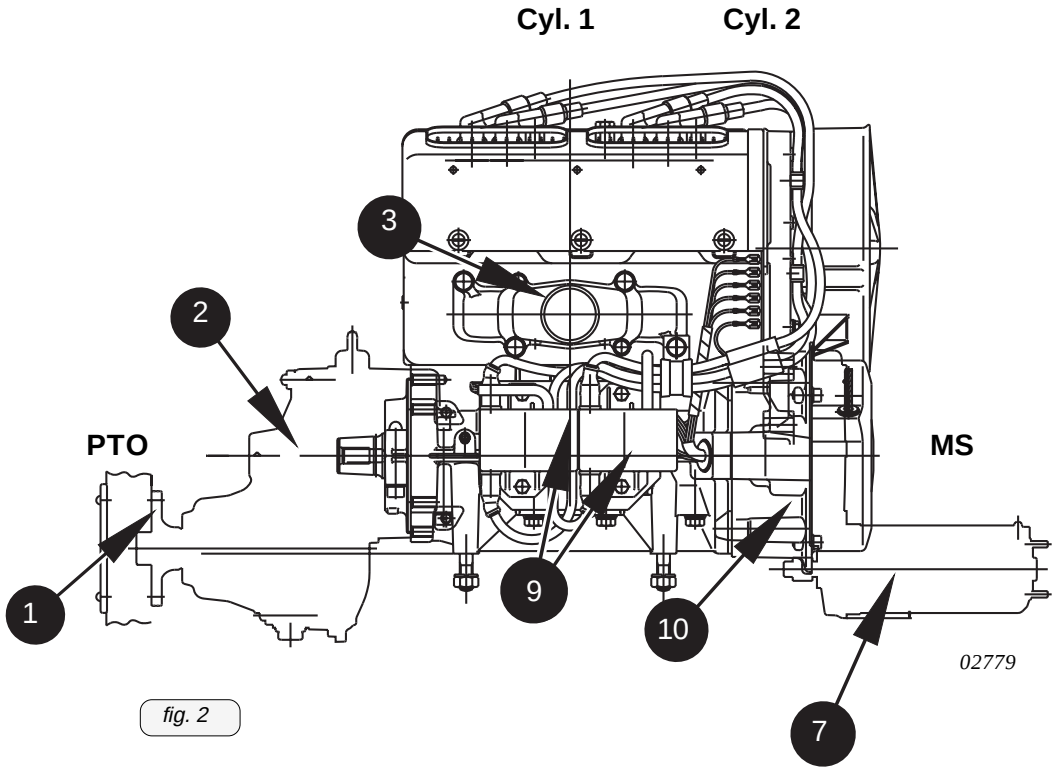


fig. 2

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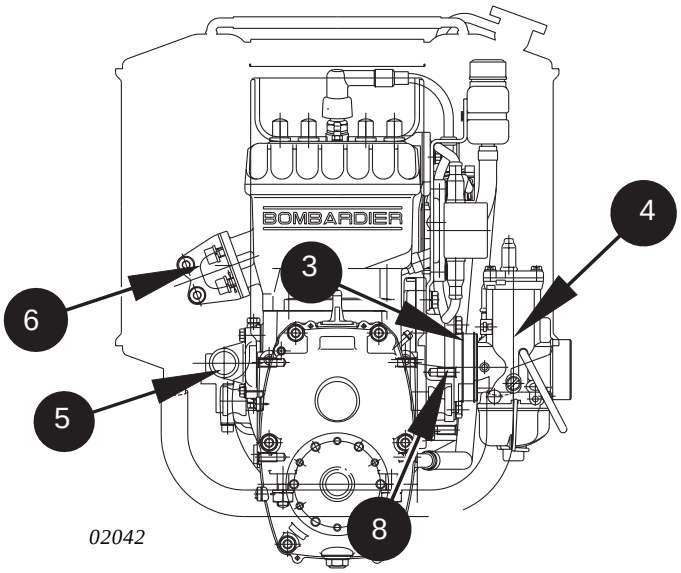
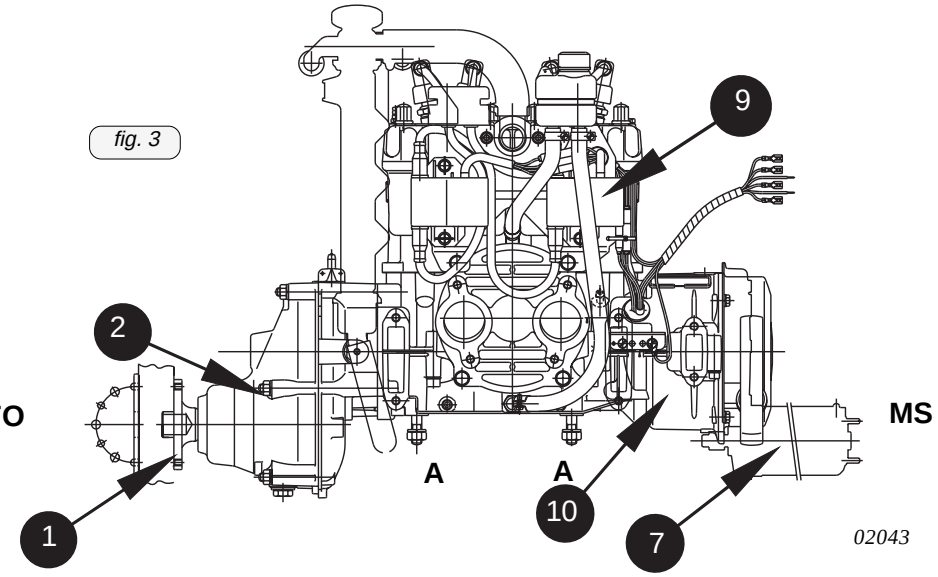
6.3.3) 582 UL DCDI and 582 UL DCDI mod. 99



Cyl. 1 **Cyl. 2**

fig. 3



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7) Technical data

For technical data and limits of operation refer to the latest revision of the current Operator's Manual 447 UL SCDI- 503 UL DCDI- 582 UL DCDI Model 99.

◆ NOTE: Connecting dimensions, filling capacities, drive and reduction ratios, electric output etc. can be found in the respective chapter of engine installation.

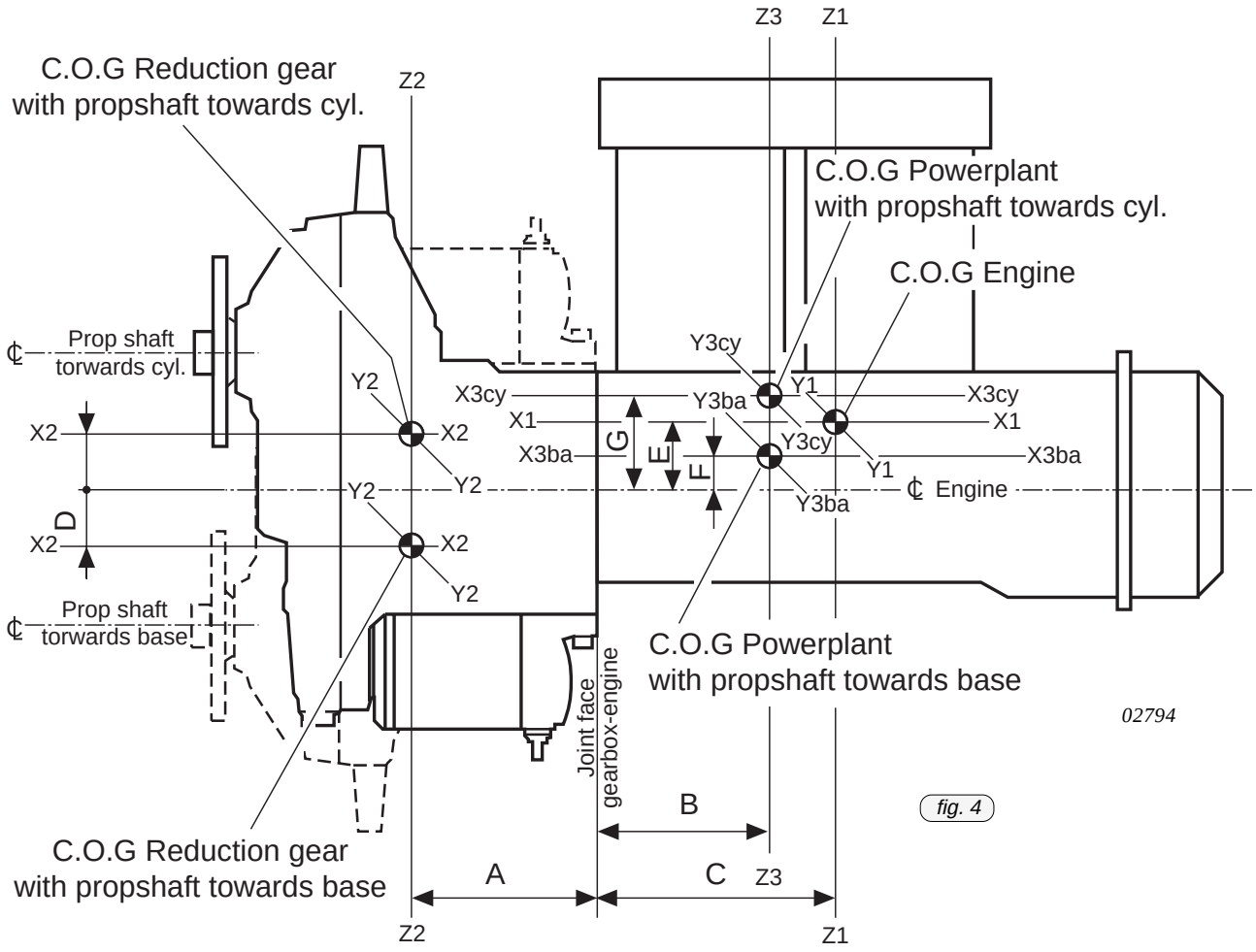

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fig. 4

7.1) Installation dimensions (all dimensions in mm)

	Total dimension		
	447 UL SCDI	503 UL DCDI	582 UL DCDI / mod. 99
max. dimension x axis	543	556	582
max dimension y axis	523	513	437
max dimension z axis	416	374	387

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7.2) Weights

Weight of engine defined to the following conditions:

☞**Engine dry** from serial production (see chapter description of design)

Weight of
electric starter.: ..... 3,5 kg (7,71 lb.)
gearbox “B”.: ..... 4,5 kg (9,99 lb.)
gearbox “C”.: ..... 8,0 kg (17,64 lb.)
gearbox “E”: ..... 11,2 kg (24,69 lb.)
generator 220 W DC: ..... 1,1 kg (2,42 lb.)
2 radiators big (582 only): ..... 2,2 kg (4,85 lb.)

radiator 995 697 (582 only): ..... 1,0 kg (2,20 lb.)
fresh oil pump (not 447): ..... 0,1 kg (0,22 lb.)
intake silencer: ..... 1,1 kg (2,42 lb.)
after muffler: ..... 1,6 kg (3,52 lb.)

7.3) Centre of gravity and moments of inertia

Power Plant	Engine assy with carb and exhaust manifold							
Engine type	Carb	Exhaust manifold	weight (kg)	Location of C.O.G. (mm)		Moment of inertia around axis (kgcm^2)		
				C	E	x1-x1	y1 -y1	z1 - z1
447 UL SCDI	1 x BING	879458	29	148,7	70,5	3411	4430	3854
503 UL DCDI	1 x BING	878936	31,7	146,7	76,5	3777	5530	4197
582 UL DCDI / mod. 99	2 x BING	973122	30,2	154,5	58	3150	4684	4118

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Reduction gear assy.

Type of gearbox	Weight (kg)	Location of C.O.G. (mm)		Moment of inertia around axis (kgcm2)		
		A	D	X2-X2	Y2-Y2	Z2-Z2
B	5,3	92	46	166	256	184
C	8,1	102	37	317	456	315
E	11,3	125	5	684	1005	554
EL	12,4	144	13,5	682	1186	717

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8) Preparations for engine installation

■ ATTENTION: The stated directives are measures needing your attention at engine installation to prevent accidents and engine damage.

8.1) Engine preservation

See latest revision of the current Operator's Manual 447 UL SCDI- 503 UL DCDI ,582 UL DCDI and 582 UL DCDI mod. 99.

8.2) Protective covering

All openings are protected against ingress of contamination and dampness. It is recommended not to remove these plugs until installation of the specific feed line.

◆ NOTE: If the engine will be sent to the manufacturer or distributor reuse transport equipment and replug openings.

List of protective covering:

☞ carburetor inlet: ..... 1 each cover

☞ fresh oil pump: ..... 1 plug

☞ vent screw, gearbox: ..... 1 cap

☞ exhaust: ..... adhesive tape

▲ WARNING: Protective covering to be utilized for transport and at engine installation only. All shipping and preservation devices must be removed prior to engine operation.

d00318

9) Engine suspension and position

■ ATTENTION: At installation of engine be aware of engine weight and assure careful handling.

The engine suspension is determined essentially by the aircraft design. Four attachment points are provided on the engine.

▲ WARNING: All four attachments points must be utilized.

9.1) Definition of attachment points

9.1.1) 503 UL DCDI, 582 UL DCDI and 582 UL DCDI mod. 99

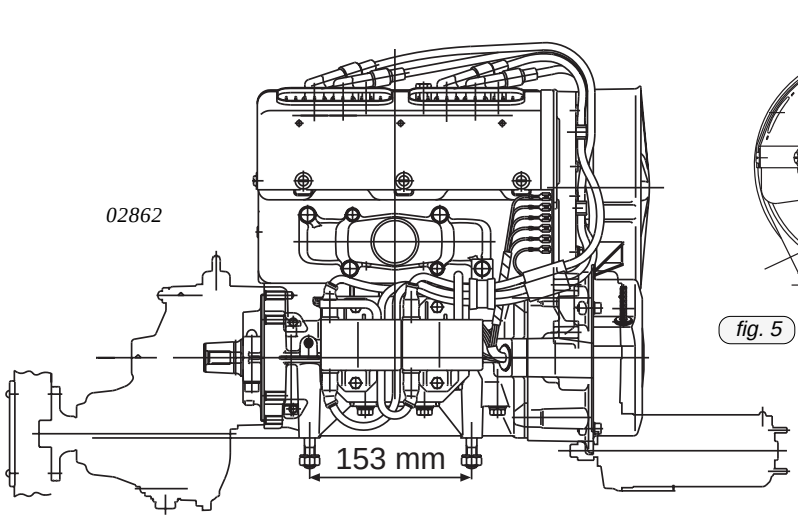
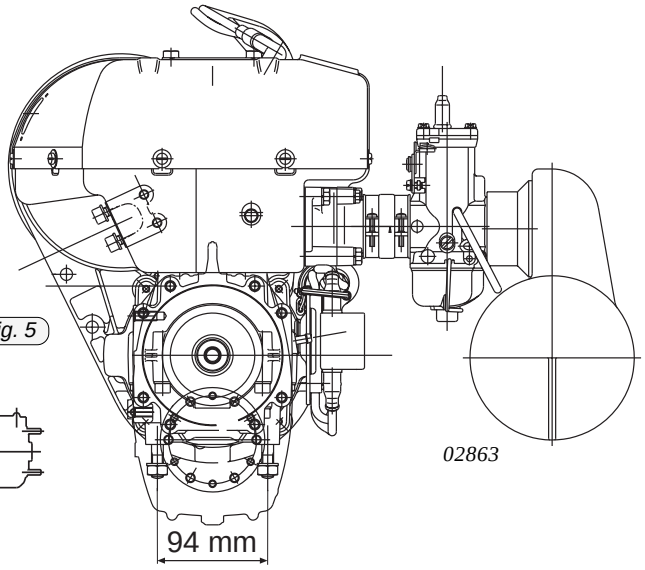


fig. 5



9.1.2) 447 UL SCDI

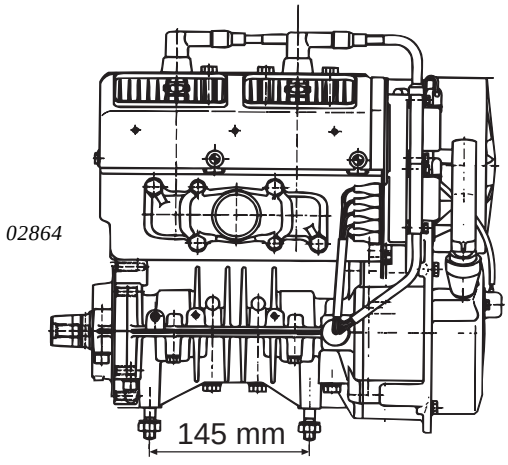
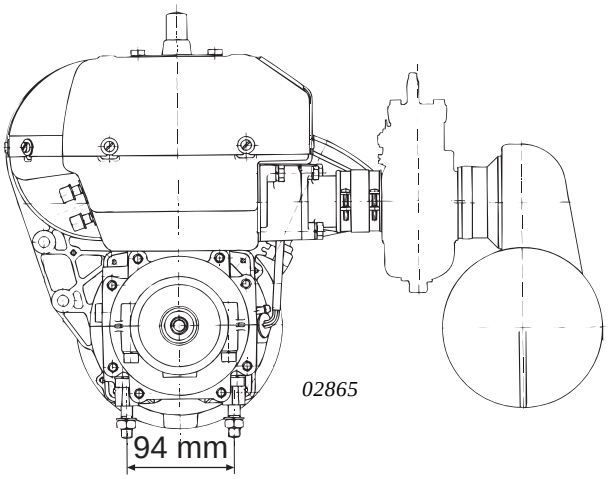


fig. 6



d00319

▲ WARNING: The engine suspension must be designed by the aircraft or fuselage builder such that it will carry safely the maximum occurring operational loads without exceeding the max. allowable-forces and moments on the engine attachment points.

▲ WARNING: Tighten all engine suspension screws as specified by the aircraft builder. Do not overtighten engine hardware. Follow recommended manufacturers torques.

9.2) Permissible fitting positions

Take care that all limits are in compliance with the Operator's Manual and Installation Manual.

■ ATTENTION: Ensure that the carburetors are positioned vertical in normal flying position to warrant proper operation of the floats in the carburetor.

9.3) General directives for engine mounting

Isolation mounts must be used between engine and aircraft frame to neutralize vibrations.

Damping elements as generally used in the aircraft industry are suitable.

◆ NOTE: The engine suspension must be designed to prevent any excessive engine movement and to minimize noise emission and vibration on air frame side.

▲ WARNING: Respect manufacturers recommended torques at engine installation.

d00319

10) Exhaust system

▲ WARNING: Considerable effort has gone into the design of the ROTAX exhaust system. Any changes to the original system may severely deteriorate performance, reliability, engine life, fuel economy and ability of noise reduction. Improper handling or modification of the exhaust system as supplied could ruin the engine.

■ ATTENTION: Beware of any accessory systems that advertise an improvement over stock components.

The exhaust system is tuned for the respective engine and performance and must not be changed. If modifications are inevitable, then the mid length of inlet tube between exhaust flange and muffler must be maintained without fail (see ill. 7). For necessary modifications, ask for manufacturer's approval in writing. Check engine performance with serial exhaust system, prior to any modification.

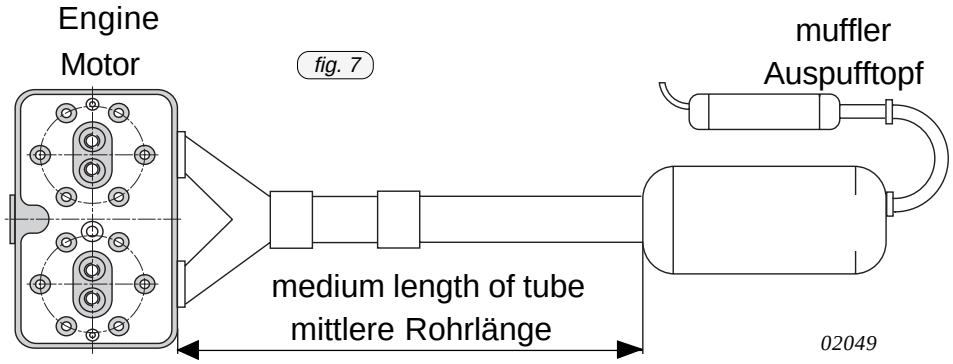


fig. 7

For engine type 582 UL DCDI 40 with reduced performance and noise emission an exhaust is offered that consists of items to be fitted by the aircraft manufacturer to suit the aircraft. Consult the respective parts list for parts needed.

■ ATTENTION: Pay special attention to maintain medium length of tubes. When using bent tubes, refer to length of centre line.

Engine type	medium length of tube
ROTAX 582, 40 kW	660 mm (26")

Check exhaust system prior to every flight for tightness, physical damage or changes in sound pattern. Especially inspect springs and hooks.

10.1) Installation of the exhaust system:

The muffler must be supported on vibration damping blocks. All ball joints must be greased regularly with heat resistant lubricant (e.g. LOCTITE Anti-Seize, 297 431) to avoid gripping or seizing of joints and consequent breaking of exhaust components.

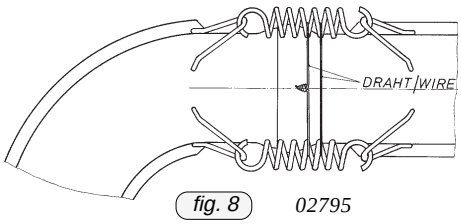


fig. 8

Springs used on exhaust system must be secured against loss and vibration (see Service Information 11 UL 87-E, page 5).

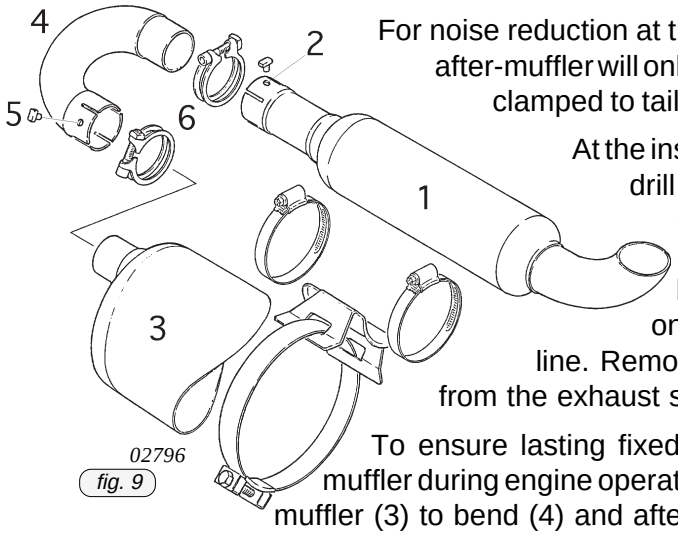
d00320

■ ATTENTION: Vibration due to improper suspension is by far the most common reason for damage to the exhaust system.

▲ WARNING: Don't use any sharp tool for removal of the tension spring for reason of possible damage of spring wire. A hook bent out of a 5 mm Ø bar is the most suitable tool.

◆ NOTE: Ensure that exhaust system is properly supported and maintained.

10.2) After-muffler system:



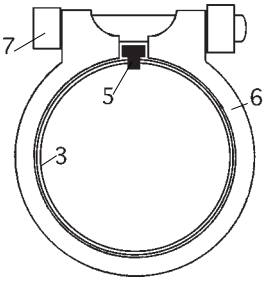
02796
fig. 9

For noise reduction at the tail pipe, an after-muffler can be fitted. This after-muffler will only slightly affect engine performance and can be clamped to tail pipe of muffler.

At the installation of the after-muffler (1) in final position, drill the two 5,7 mm Ø holes in the bend and muffler end-pipe, for securing pin (5). The outer situated holes (2) have been already machined on the serial production line. Remove accumulated chips from the exhaust system.

To ensure lasting fixed position of the after-muffler during engine operation, the connections of muffler (3) to bend (4) and after-muffler (1) are to be secured against twisting by the securing pin (5).

Fit clamp (6) in the specific position that the Allen screw (7) prevents the securing pin (5) from dropping out.

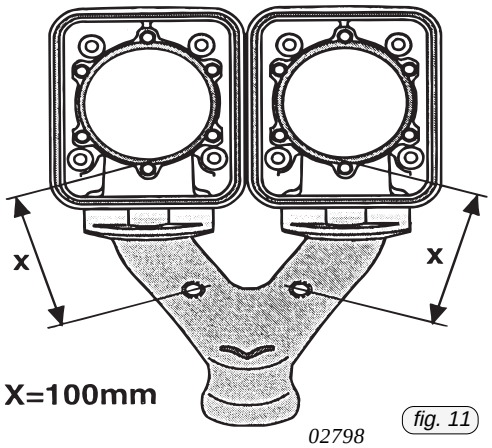


02797
fig. 10

10.3) Exhaust gas temperature (EGT):

Exhaust gas temperature will give the most rapid response in the event of improper mixture, pre-ignition or detonation. Ideally the exhaust temperature should be measured about 100 mm (4 in.) from the piston, with separate sensors for each cylinder.

EGT (max.) = 650 ° (1200 °F)



02798
fig. 11

■ ATTENTION: The exhaust manifold is provided with tapped holes. If the EGT is not measured the holes must be closed with screws which must be safety-wired.

d00320

11.) Cooling system

11.1) Fan cooling (ROTAX 447 UL SCDI, ROTAX 503 UL DCDI)

The engine driven cooling fan provides sufficient cooling air, provided that the cooling air has free access and the hot air is not recirculated to the fan.

On aircraft equipped with engine cowlings the exit must be of sufficient size and in a low pressure area allowing the air to cool engine cabin and crankcase.

11.2) Free air cooling (ROTAX 447 UL SCDI, ROTAX 503 UL DCDI)

Means ram air cooling, for engines without fan.

In case of a tractor propeller configuration, with the propeller blowing air onto the cylinder(s), this air stream serves for engine cooling.

On 2-cylinder-engines the air stream must be directed from the exhaust side towards the carburetor side with suitable ducting (available from ROTAX).

Pusher propeller configurations should not be used with free air cooled engines without consulting the engine manufacturer (in writing).

11.3) Liquid cooling (ROTAX 582 UL DCDI and 582 UL DCDI mod. 99)

These engines have an integrated water pump. The cooling circuit must be arranged as shown on the illustrations 12 to 17. Pay attention to the following:

◆ NOTE: The 582 UL DCDI mod. 99 has a two circuit cooling system. (see latest revision of the current operators manual 447 UL SCDI-503 UL DCDI-582 UL DCDI.

11.3.1) Coolant flow

Should be in the range of 60 - 70 litres/min. at engine r.p.m. 6500. See ill. 18.

11.3.2) Cooling liquid temperature

The radiator must be of adequate size, and the airstream of sufficient intensity to maintain the coolant temperature below the maximum permitted value of 80°C (175 °F) under the most severe conditions, i.e. at full load operation (= at take-off).

The average coolant temperature must be 60 - 80°C (140 -175 °F).

In case of a pusher propeller installation, take particular care that coolant radiator has sufficient air flow.

The max. temperature difference of the coolant between radiator entry and exit must not exceed 6 °C (11 °F), the average difference must be around 3 and 5 °C (5 and 9 °F).

If temperature limits are exceeded or coolant flow rate is below specified values (excessive flow resistance), vapour is produced in the cylinder head, causing cooling break-down and engine damage.

d00321

11.3.3) Anti-freeze additives

◆ NOTE: Anti-freeze additives reduce the cooling effect. This should be taken into consideration at choice and installation of the radiator.

11.3.4) Cooling system

To avoid coolant pump cavitation, the cooling system must be under pressure. This is achieved by using a pressure cap with a release pressure of approx. 0,9 bar (13 psi).

The coolant hoses must be installed in such a way that air and steam bubbles can escape from any point of the system towards the expansion chamber.

The overflow hose (10) coming from the radiator neck is to be led into a vented overflow bottle (11) . It should be half filled with coolant. The overflow hose must reach into the coolant or enter at the bottom of the overflow container.

The overflow bottle should be fitted not lower than 250 mm (10 inch) below the radiator cap. When the system cools down, the originally displaced liquid is sucked back through the breather valve in the radiator cap.

◆ NOTE: If the coolant is not sucked back, the cooling system is faulty and must be checked.

◆ NOTE: If at 582 UL DCDI model 99 a straight water outlet socket is used, vent the cooling system well, check after a short operating period at a temperature higher than 65°C (150°F), and refill coolant as required.

d00321

11.3.5) Cooling circuit

for engine installation with spark plugs up

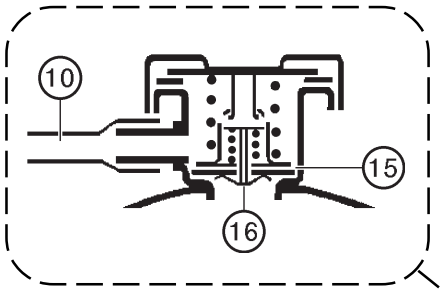


fig. 13 02801

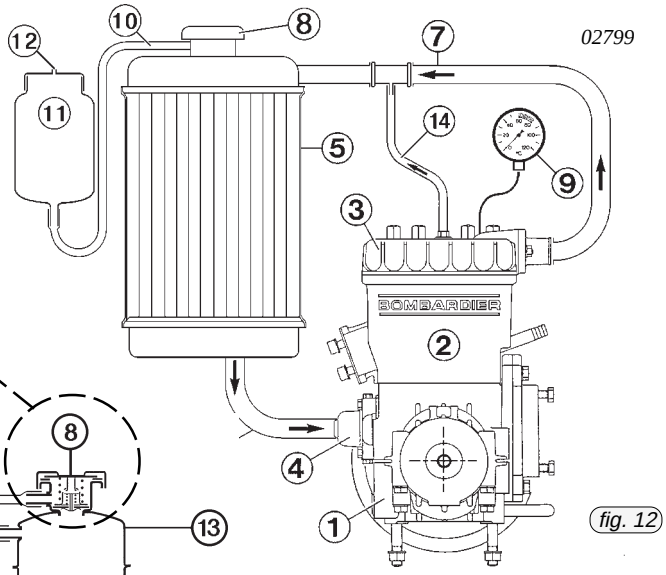


fig. 12

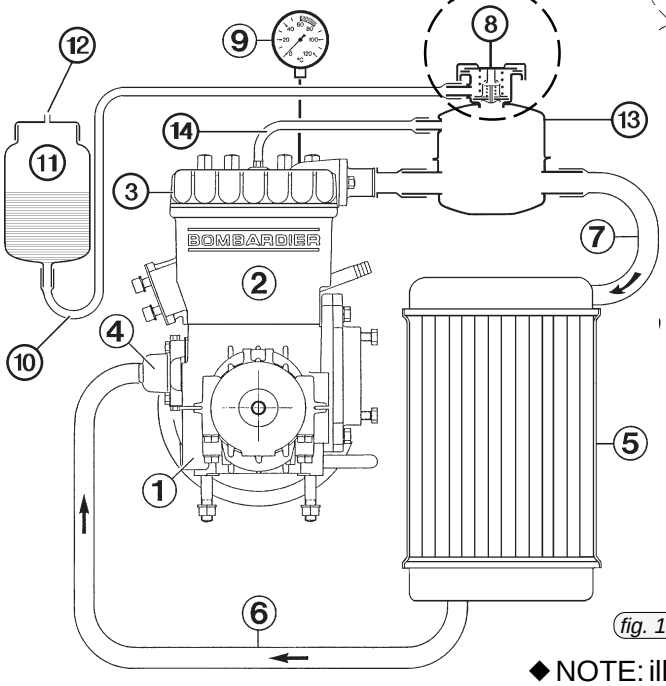


fig. 14

◆ NOTE: illustration shows 582 UL DCDI

1	crankcase	10	overflow hose
2	cylinder	11	overflow bottle
3	cylinder head	12	bottle venting
4	water pump	13	expansion tank
5	radiator	14	cylinder head venting hose
6	hose from radiator to the water pump	15	excess pressure valve
7	hose from cylinderhead to the radiator	16	return valve
8	radiator cap, with excess pressure valve and return valve		
9	temperature gauge for cooling water		

d00321

11.3.6) Cooling circuit
(for engine installation with spark plugs down)

For this installation position, a venting hose must be connected on top of the waterpump housing (4) leading to the expansion chamber (10) or to the water chamber of the radiator.

Vent the cooling system well, check after a short operating period, and refill coolant as required. Only a perfectly vented cooling system will operate satisfactorily.

▲ WARNING: Do not open cooling system until engine has cooled to outside air temperature, failure to respect this information will result in severe scalds and injuries.

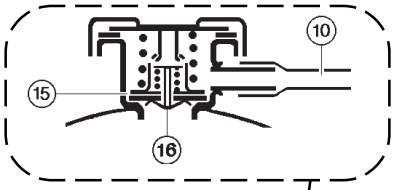


fig. 15 02802

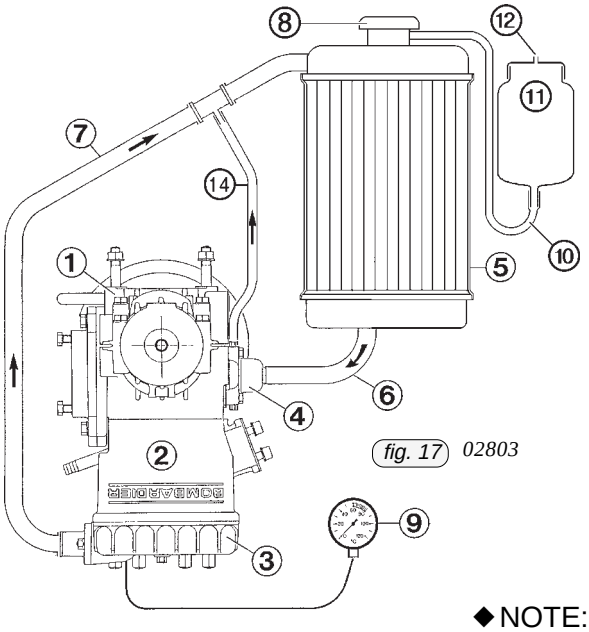


fig. 17 02803

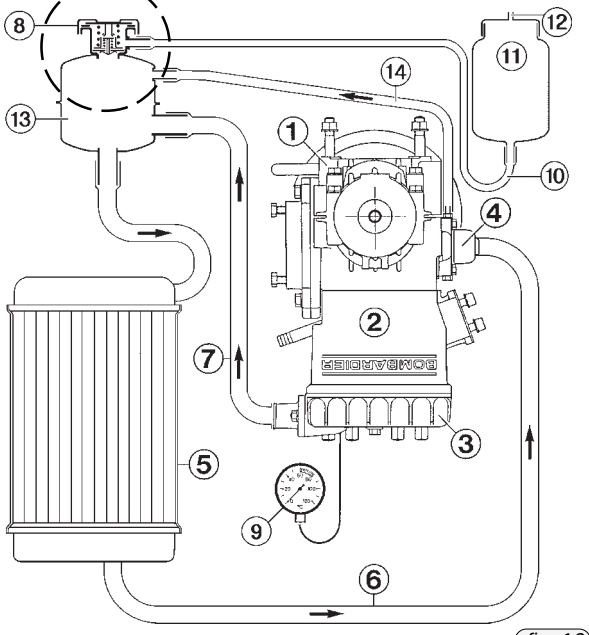


fig. 16 02804

d00321

◆ NOTE: illustration shows 582 UL DCDI

1 crankcase
2 cylinder
3 cylinder head
4 water pump
5 radiator
6 hose from radiator to the water pump
7 hose from cylinder head to the radiator
8 radiator screw cap, with excess pressure valve and return valve
9 temperature gauge for cooling water
10 overflow hose
11 overflow bottle
12 bottle venting
13 expansion tank
14 cylinder head venting hose
15 excess pressure valve
16 return valve

d00321

11.3.7) Water pump performance diagram and cooling system flow resistance graph:

measured on: Standard 582 UL DCDI with double radiator set

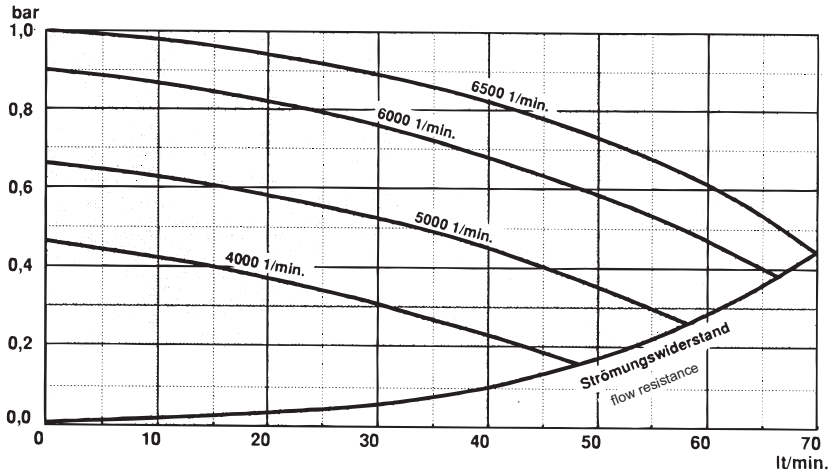


fig. 18

02808

d00321

12) Lubrication system

If the engine is to be used inverted (with spark plugs pointing down) select a lubricant which features low carbon deposits. Oil residues tend to drain to low points, i.e. spark plug cavities. If these residues fail to burn during normal operation, plug fouling will occur, possibly causing pre-ignition. Producers of suitable lubricants will issue warranty of their products.

12.1) Mixture lubrication

Refer to latest version of current Operator's Manual.

12.2) Oil injection for engine lubrication

12.2.1) General advice:

The oil pump driven by the crankshaft via the pump gear supplies fresh oil for engine lubrication. The oil pump is a piston type pump with a metering system. Via diffuser jets in the intake cover or intake socket each cylinder is supplied with exactly proportioned quantity of two-stroke oil. The oil quantity consumed is defined by the engine r.p.m and the oil pump lever position. This lever is actuated via a Bowden cable connected to the throttle cable. The oil flows to the pump from an oil tank by gravity.

▲ WARNING: In case of fresh oil lubrication the carburetors are supplied with pure gasoline (no oil/gasoline mixture).

12.2.2) Technical data and configuration:

Oil: Super two-stroke oil.

The oil pump assy. features an oil return nipple and two oil exit nipples with integrated check valve.

12.2.3) Installation

1) Oil tank capacity: The oil tank size should be more than 5 % of the fuel tank capacity.

2) The oil tank bottom outlet must not be below the oil pump inlet nipple, even at the greatest possible inclination of the aircraft (i.e. dimension Hs must be greater than zero, see fig. no. 20).

3) Use a firm, oil-resistant suction hose which cannot be squeezed. Secure it with clamps at the connections.

4) Install an adequate oil filter between oil tank and oil pump.

5) Install a Bowden cable to actuate the pump lever simultaneously with the carburetors.

■ ATTENTION: At a pump cable breakage or failure. On the ROTAX 582 engine, oil pump is set to minimum discharge. On the ROTAX 503 engine the oil pump is set to maximum discharge.

d00322

6) Adjustment of oil injection pump alignment marks: At throttle lever idle position the 2 marks must align (see fig. no. 19).

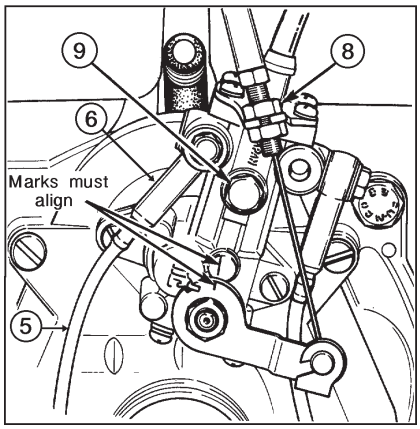
7) Vent the suction hose before engine start by opening the vent plug (see fig. no. 19, pos. 9) until all air is vented from that line. Close vent plug carefully.

8) It is recommended to fill the first tank of fuel with a gasoline oil mixture at a mixing ratio of 100: 1. This is for safety until the complete system is properly filled with oil.

◆ NOTE: This oil injection will not affect or replace the rotary valve gear lubrication nor the reduction gearbox lubrication.

Installation at ROTAX 582 UL DCDI and 582 UL DCDI mod. 99

(1) Engine
(2) Oiltank
(3) Suction hose
(4) Oil pump
(5) Discharge line
(6) Checkvalve
(7) Oil intake port
(8) Adjuster nuts
(9) Venting
(10) Oil filter



02805
fig. 19

◆ NOTE: Oil pump aligning marks for the 503 and 582 are identical.

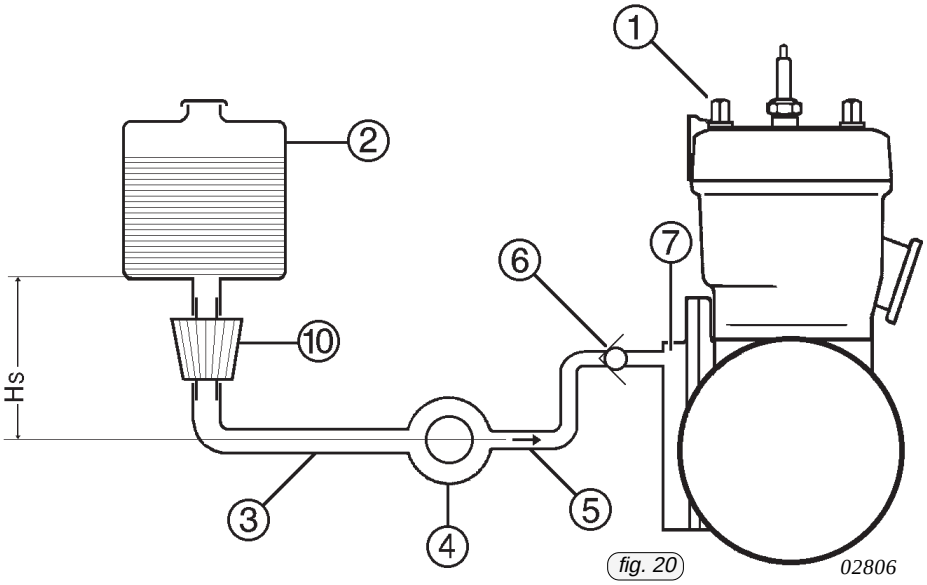


fig. 20 02806 d00322

Installation at ROTAX 503 UL DCDI

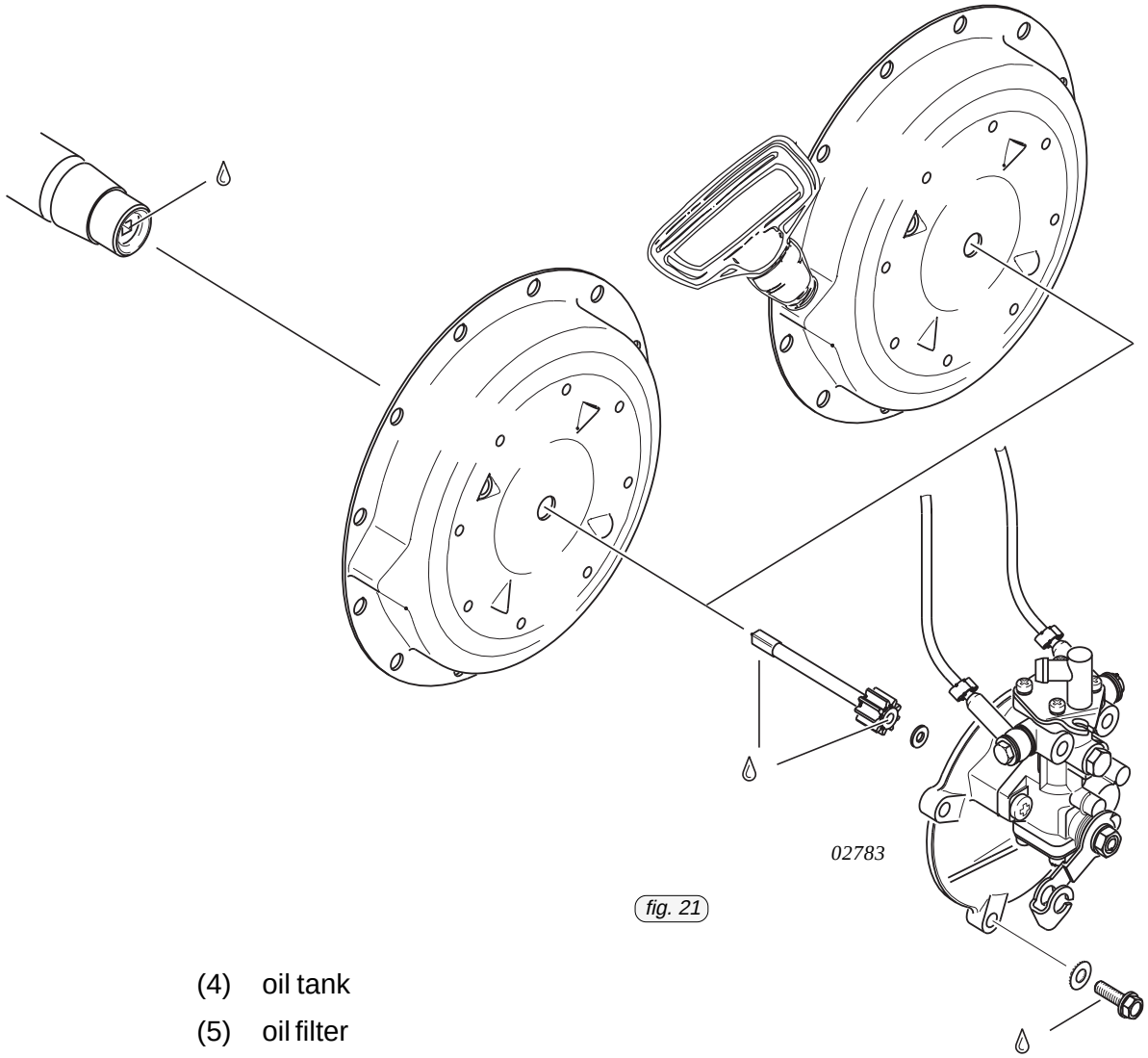


fig. 21

(4) oil tank
(5) oil filter
(6) suction hose
(7) oil pump
(8) pressure hose
(9) check valve

d00322

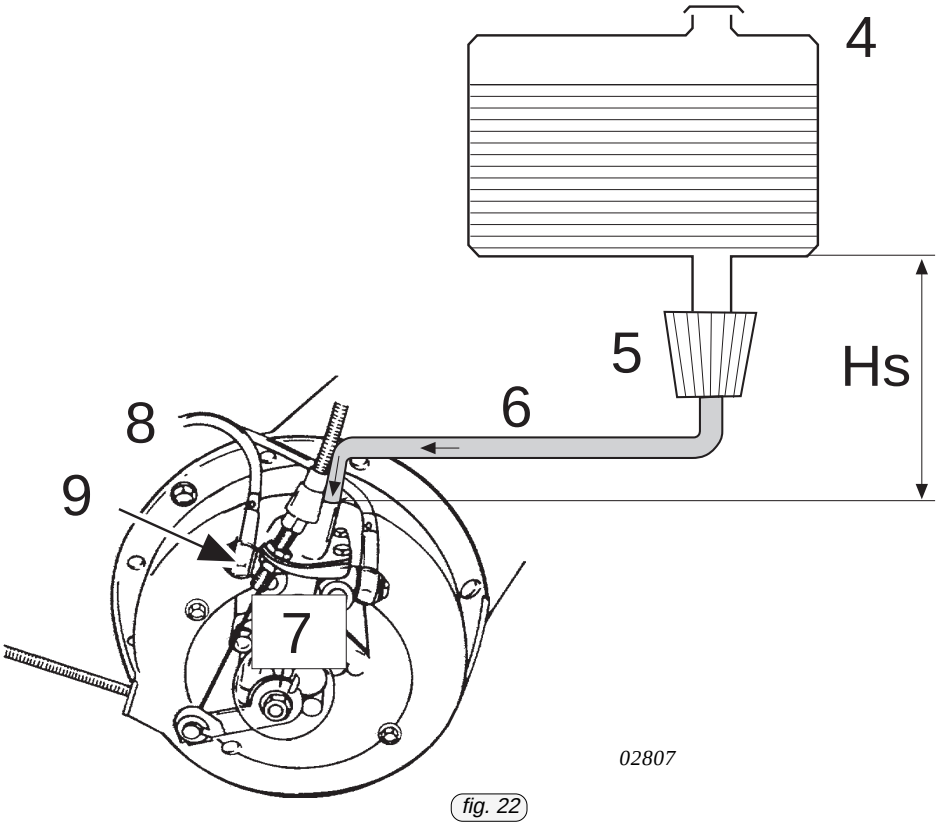


fig. 22

◆ NOTE: The dimension „**Hs**“ must be positive (also at descent or climb).

d00322

13) Rotary valve and water pump drive:

In the center of the crankcase a 90 ° transfers drive in oil bath is located.

Use 2-stroke motor-oil for the rotary valve drive (same as used for 2-stroke fuel mixture). Oil quantity on a new installation: approx. 310 cc.

An oil hose leads from the oil tank to the bottom side of the crankcase, and a return line from top of the gear leads back to the tank for venting (see illustration).

Before every operation check the oil level (approx. mid height of the oil tank). Check oil tubes for security and condition of connections.

In case of notable oil consumption (more than 1 ccm/hour) look for the leak and check the oil seals inside the crankshaft, as necessary.

13.1) Oil circuit for engine installation with spark plugs "up":

(1) crankcase
(2) cylinder
(3) cylinder head
(4) inlet tube
(5) return line
(6) oil tank
(7) spark plug
(8) vent plug

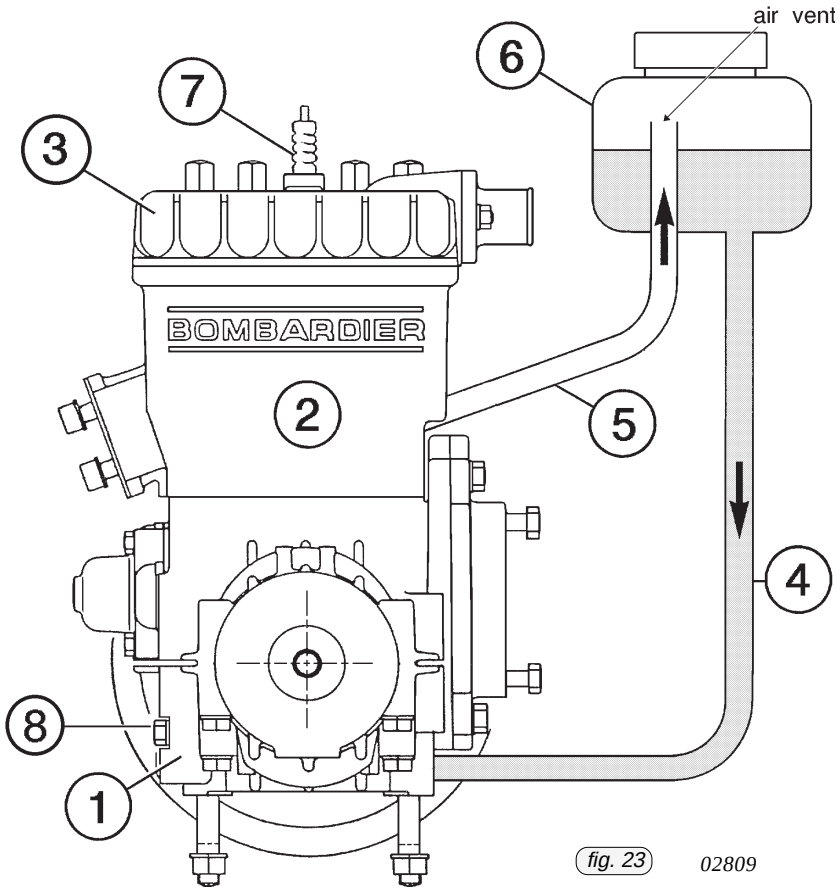


fig. 23 02809

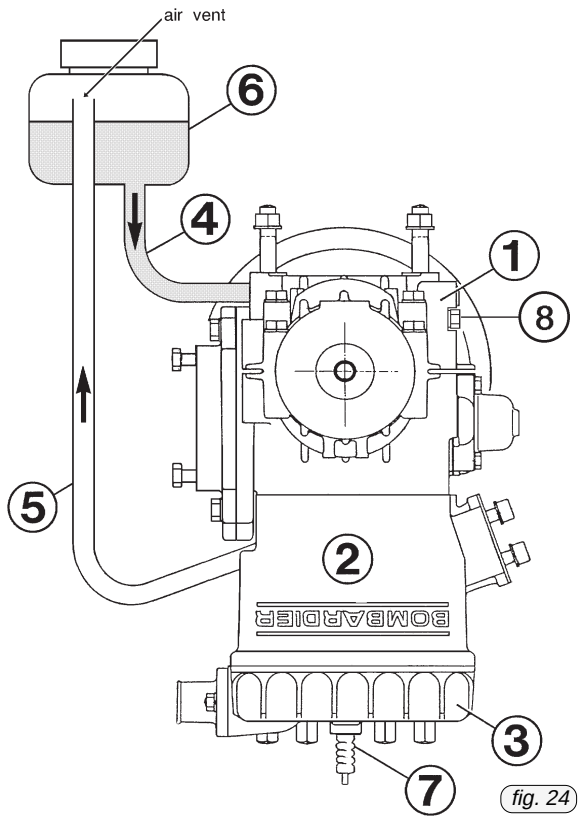
d00323

13.2) Oil circuit for engine installation with spark plugs "down":

In this arrangement the oil system for rotary valve drive and water pump drive must be modified by the aircraft manufacturer as per the following illustration. The oil tank installation should not be below the oil inlet tube (4).

■ ATTENTION: For inverted installation, the oil tank must be removed from the bracket and installed in a suitable location above the engine. Vent system by removing plug (8) when filling the oil tank (6).

(1) crankcase
(2) cylinder
(3) cylinder head
(4) inlet tube
(5) return line
(6) oil tank
(7) spark plug
(8) vent plug



02810

fig. 24

d00323

14) Gearbox installation and gearbox lubrication

■ ATTENTION: Use only suitable oil.

Oil capacity on the new gearbox:

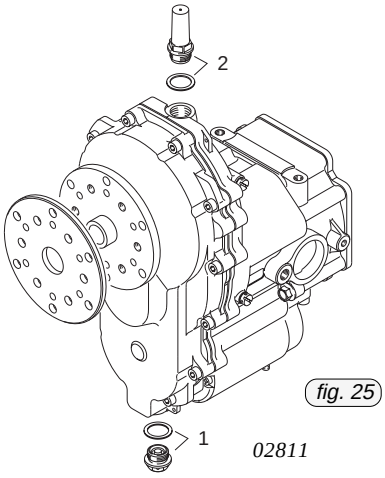


fig. 25

	gearbox type		
position of installation*	B	C/CL	E/EL
SZ	330 cm^3	200 cm^3	400 cm^3
SS	300 cm^3	120 cm^3	180 cm^3

*see fig. 27

02978

■ **ATTENTION: For gearbox installation refer to SI 9 UL 94 and SI 10 UL 94.**

- The gear box can be installed in two basic positions:

SZ = upright with prop shaft towards cylinder

SS = inverted with prop shaft towards engine base

According to position of gear box, fit magnetic plug and sealing ring (1) (tightening torque 24 Nm = 212 in.lb.) and vent screw with sealing ring (2) (tightening torque 6 Nm = 53 in.lb.)

- Generally replenish oil, until oil emerges at the respective lower oil level plug (3).

  ■ ATTENTION: The two large ventilation bores (6) on both sides of gear housing have to remain always open to warrant dissipation of heat.

- Wire-secure vent screw, oil level plugs and drain plug (D).
- With the installation of an EL gear box the tapped holes for radiator support are transferred from gear box housing to adapter housing.

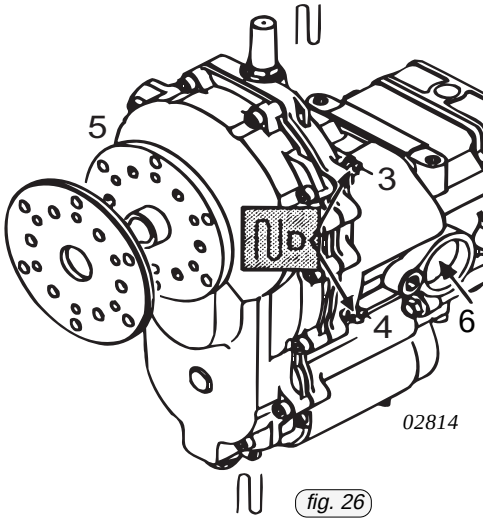


fig. 26

d00324

■ ATTENTION: At trial run, check tightness without fail!

- The propeller flange (5) is furnished with 6 tappings M6 and 6 holes each of 6,5 mm and 8,2 mm dia., but screws are not in the supply scope.

■ ATTENTION: With use of ROTAX gear box type **"C"** (CL) or **"E"** (EL) the moment of inertia of the propeller must not be in excess of **6000 kgcm² ("B" type gearbox: 3000 kgcm²).** Enquire for moment of inertia and have it confirmed by the manufacturer of propeller in writing.

■ ATTENTION: Gearbox „B" with reduction ratio i= 3,00 is only allowed to be used only for engine versions up to 40 HP (= 29,4 kW).

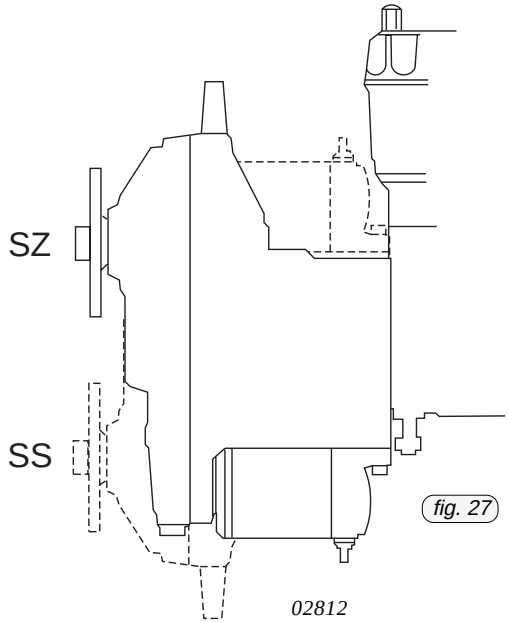


fig. 27

d00324

15) Fuel System

Schematic arrangement, 1 carburetor version

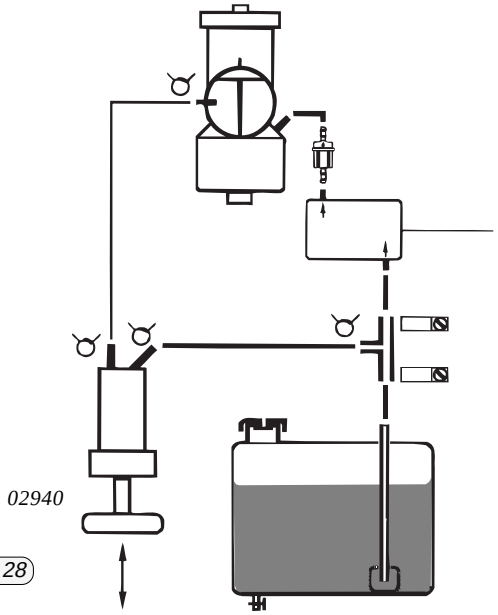


fig. 28

Schematic arrangement, 2 carburetor version

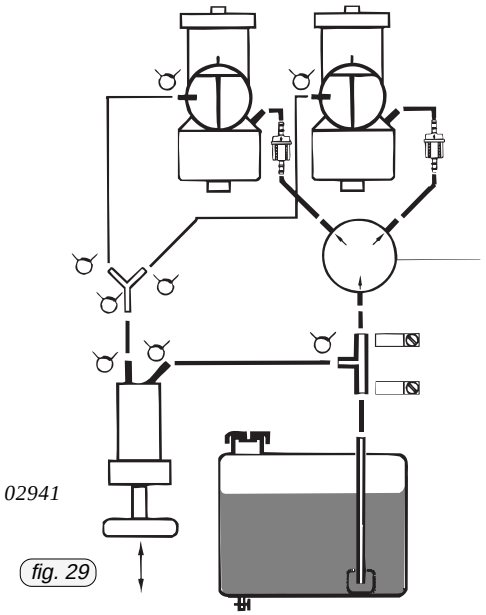


fig. 29

Fuel contamination is a major cause of engine failure. The best place to avoid contamination is at the source. Once fuel is in your container, a very harzardous potential exists.

Use a clean safety approved storage container. Filter all fuel entering and leaving this container. Do not over-fill container, allow for expansion.

▲ WARNING: Gasoline is flammable and explosive under certain conditions. Always perform fueling procedures in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Never add fuel while engine is running.

The carburetor(s) is (are) supplied with fuel by the fuel pump provided with the engine.

The pump is actuated pneumatically via an ,impulse line leading from the nipple on the crankcase to the fuel pump. This line should not be longer than 500 mm (20 in.) and must be of stiff and fuel-resistant material.

The fuel pump should be installed in a cool place (not on the engine itself),with the small drain hole near the impulse connection towards the bottom. This hole drains oil condensate from the pump diaphragm chamber.

If possible, the pump should be located below the fuel tank level.

If the fuel tank is considerably lower than the engine, an electric pump should be used. This pump is to be connected in parallel as in case of series-connection the fuel pressure would be excessive.

d00325

The electric pump must produce a pressure of minimum 0,2 bar (3 psi), and together with the pneumatic pump max. 0,5 bar (7 psi) resp. max. 0, 4 bar (6 psi) in case of a diaphragm carburetor, and must allow free flow-through, even when switched off.

A suitable fuel filter of 0,15 mm mesh size must be fitted between pump and carburetor. Do not use paper filters. The fuel tank must have a drain cock for condensed water. A screen of 0,3 mm mesh size should be fitted to the fuel line in the tank. Never restrict the normal fuel flow.

The fuel lines and impulse line must be of a type to comply with national regulations. The minimum diameter is 5 mm (0,2 in.).

If the fuel tank is placed higher than the carburetor, the tank connection must have a fuel cock (with filter) to shut off the fuel supply when the engine is not running.

▲ WARNING: The carburetor needle valve is not sufficiently tight to seal for a prolonged period of time and during transport.

National regulations may require a fuel cock to be fitted even if the fuel tank is below the carburetor.

The carburetor needle valve is not to be used as a fuel cock.

d00325

16) Carburetor

The carburetor can be adjusted by jet replacement of various approved sizes, and by adjusting idle air/fuel mixture screw, carb piston stop adjustment, needle sizes, and needle position.

The air/fuel mixture at idle speed is adjusted by the air adjusting screw. The idle r.p.m. is adjusted by the carburetor piston adjustment screw.

◆ NOTE: These idle adjustments interact, so adjusting one may require minor adjustment of the other.

◆ NOTE: On single carb engines, the carburetor must be in an exact right angle position in relation to the crankshaft in both views from top and from the intake side to ensure an equal mixture distribution to both cylinders (see ill. below).

Replacement of parts should be done only after proper trouble shooting has been carried out and then, by an experienced two cycle mechanic.

Ensure that throttle cable and linkage do not stick and that carb piston valve can be fully opened and closed . Minor cable backlash can be adjusted at cable adjustment screw and lock nut.

Be certain that throttle linkage is not affected by engine or airframe movement. This will change throttle settings.

Air intake filtration and/or noise reduction devices must be in place for proper carburation. See section on special operating conditions.

Special operating conditions, such as severe climate or altitude change may require different jetting. Contact your dealer.

In no case should jet changes be made by unqualified persons or those who do not have ROTAX technical information to do so.

▲ WARNING: All parts liable to become loose have to be secured.

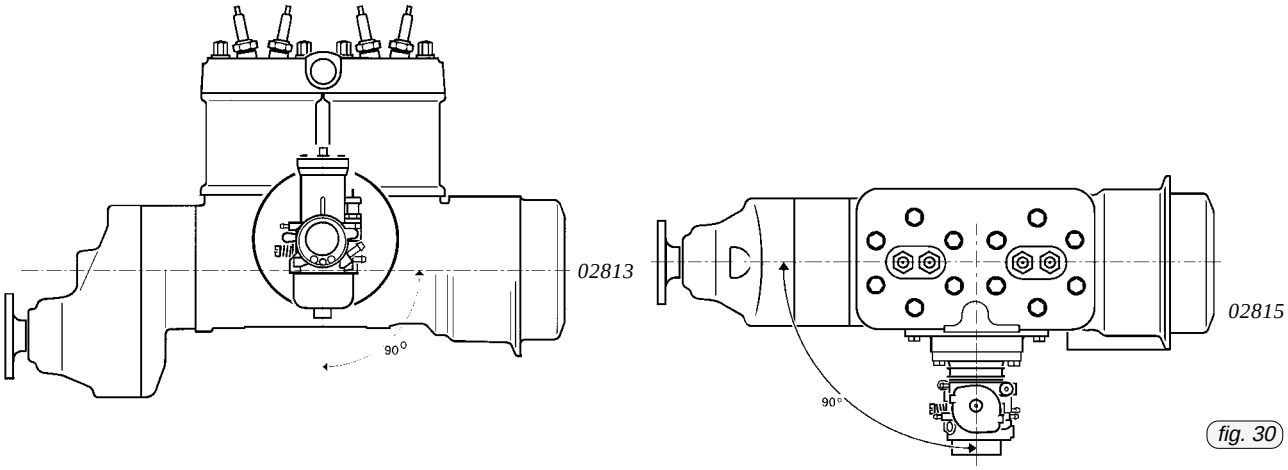
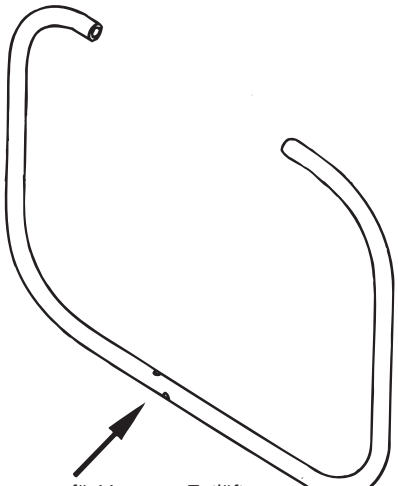


fig. 30

16.1) Carburetor air intake

The carburetor air intake must be protected against the ingestion of water, dirt and foreign material. Use a Rotax approved air filter. Avoid paper, foam and synthetic material types that absorb water.

Equal air pressure conditions must prevail in the vicinity of the carburetor air intake and the carburetor float chamber vent pipes (i.e. the pressure must not be influenced by the propeller air stream).



02816

Ausgleichbohrungen für Vergaser-Entlüftung
compensation bores for carburetor venting

fig. 31

If necessary, the carburetor intake should be shielded against effects of the slipstream by a sheetmetal shield or air intake box, and the carburetor vent pipes should be routed to a calm air zone or connected to a vent chamber (see sketch below).

Engines supplied with an intake silencer must not be operated without it unless the carburetor calibration has been altered. Consult the engine supplier or manufacturer (in writing)for details.The correct carburetor calibration is also described in the parts list.

If the aircraft is to be operated in climatic conditions where carburetor icing is likely to occur, a heating system must be fitted.

No modifications should be made to the carburetor and air intake system without consulting the engine manufacturer (in writing).

d00326

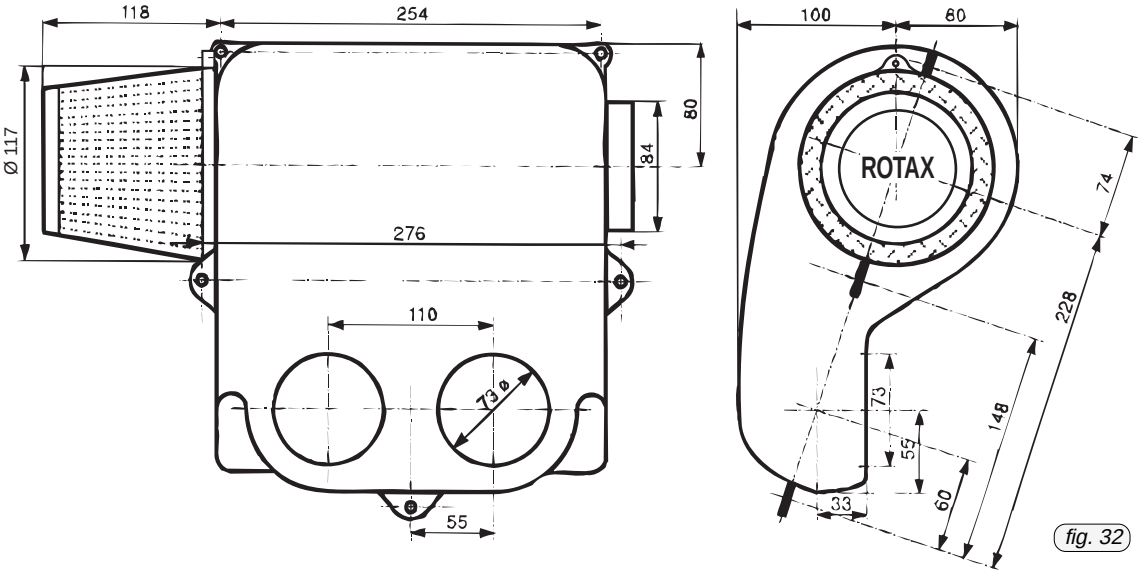
17) Air intake system

17.1) Intake silencer:

ROTAX$_{a}$ offers intake silencers as an option. Intake silencer for single and dual carbs are available from ROTAX.

■ATTENTION: At employment of an intake silencer a different carburetor jetting will be necessary.

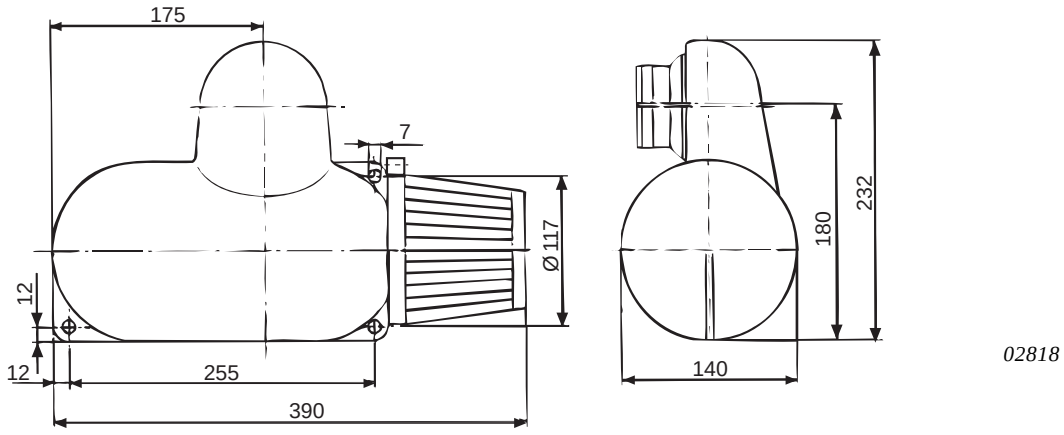
DUAL CARBURETOR VERSION



02817

fig. 32

SINGLE CARBURETOR VERSION



02818

fig. 33

■ ATTENTION: Weight of silencer must not influence position of carburetor. If need be, support silencer accordingly.

d00327

Fit silencer parallel to crankshaft axis with screw-on filter (2) not pointing towards propeller. The double intake silencer is available with either left or right hand side inlet opening, to suit respective position.

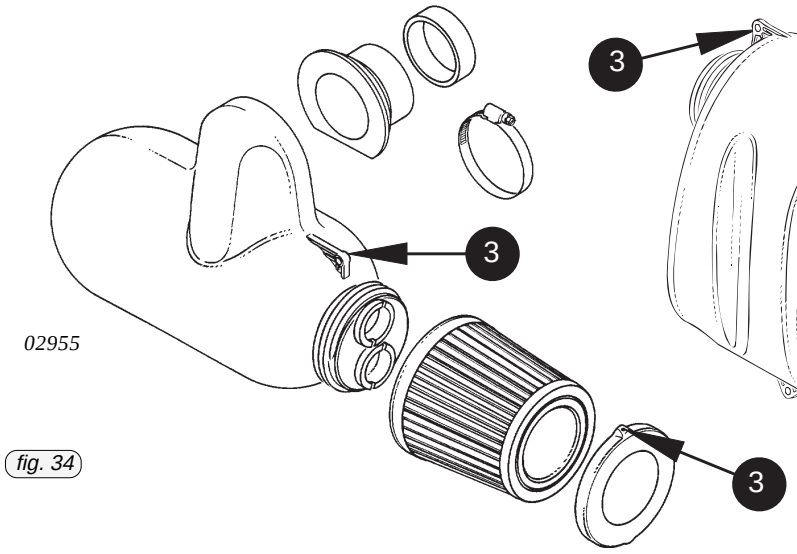


fig. 34

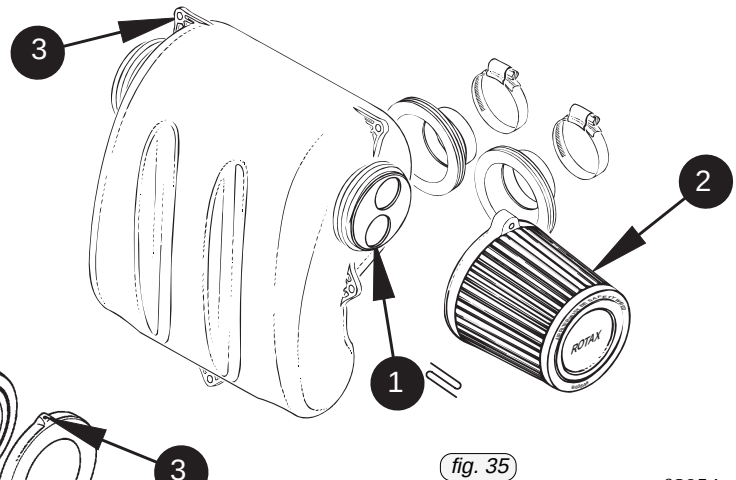
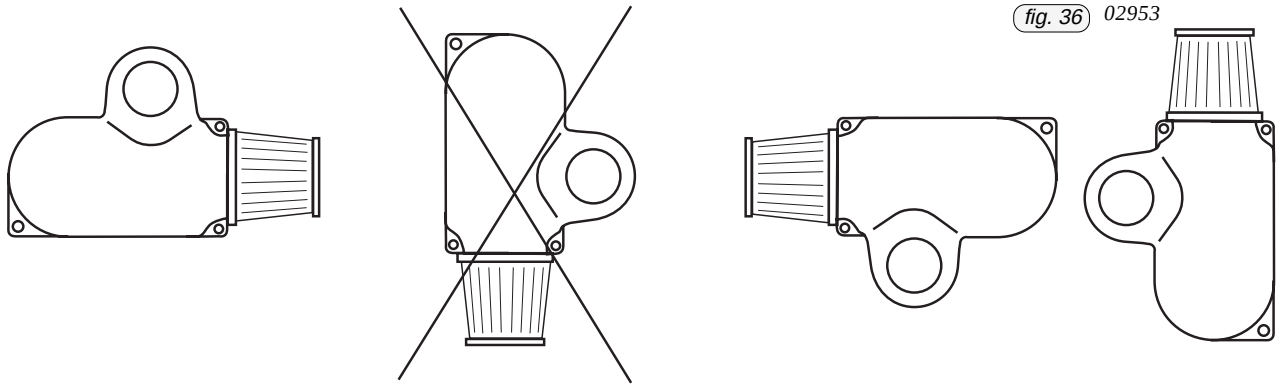


fig. 35

With the silencer on a single carburetor engine, pay special attention when fitting, as with an inclined silencer the intake situation is unsymmetrical, thus badly influencing mixture distribution possibly leaning down one cylinder, leading to a rise of combustion temperature and finally to piston seizure.

d00327

fig. 36 02953



Fitting position 1 *Fitting position 2* *Fitting position 3* *Fitting position 4*

Position 1 would be best. Positions 3 and 4 are also acceptable, but avoid unfavourable position 2.

▲ WARNING: Screw-on filter and silencer must be wire-secured against slackening and loss on the assigned lug (3).

All parts liable to become loose have to be secured.

d00327

17.2) Air filter

Only air filters approved by ROTAX are permitted for use. The air filters specified by ROTAX are special K & N air filters. Dry filter elements of paper are not allowed for humid operating conditions, as they absorb water, thus reducing the air intake leading to enrichment of the fuel/air mixture.

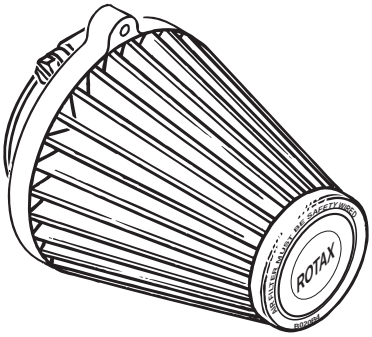
Two kinds of filter design are applied on these engines:

- Single air filter

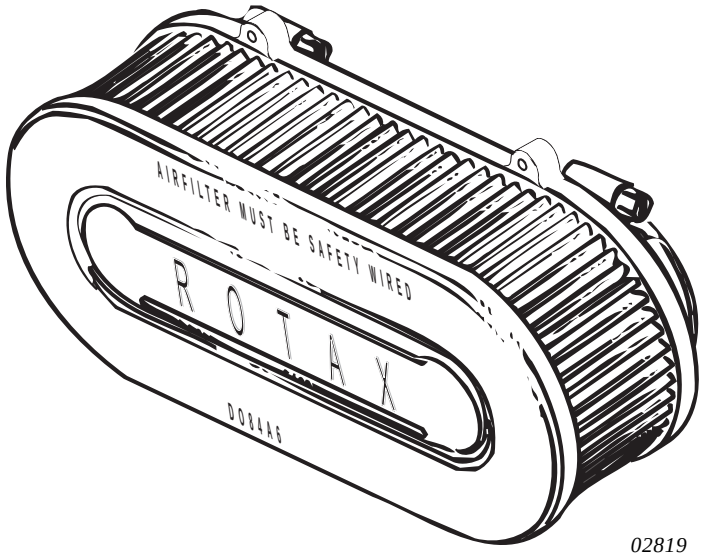
- Double air filter

With 2 carburetors on engine, either 2 single air filters or 1 double air filter may be fitted.

■ WARNING: Always secure air filters against loss.



02820



02819

fig. 37

d00327

18) Electric system

18.1) General:

The engine is equipped with a breakerless 12V 170W DUCATI capacitor-discharge dual ignition system (447 UL SCDI is only equipped with a single ignition unit). It consists of a flywheel magneto generator, 2 double ignition coils complete with integrated control-circuit and 2 external trigger coils (pick-up).

The 12-pole flywheel generator is an outer rotor type with 12 integrated permanent magnets. The stator is equipped with 12 coils. 8 of them are used for feeding auxiliary equipment and 4 are used for the dual ignition. The grey cable is foreseen for connection of a revolution counter.

18.2) Function of the ignition unit:

Two charging coils fitted on the generator stator and independant from each other each feed one ignition circuit. The energy supplied is stored in the ignition capacitor. At the moment of ignition the external trigger coils supply an impulse to the control circuits and the ignition capacitors are discharged via the primary winding of the ignition coil. The secondary winding supplies the high voltage for the ignition spark.

■ ATTENTION: When flying <u>both</u> ignition systems must be switched ON.

18.3) Wiring diagram:

◆ NOTE: When replacing wiring on the ignition system, connections must be as per wiring diagram below.

1	Electronic box	6	charging cable, green	10	rev.counter cable, gray
2	eight lighting coils	7	charging cable, white	11	mass cable, brown
3	four charging coils	8	shorting cables, black/yellow	12	ignition cables
4	pickup	9	lighting cables, yellow-yellow/black	13	spark plug connectors
5	trigger cable, red			14	spark plugs
				15	shrink tube

After installing, all the connections must be protected with the supplied shrink tubing.

◆ NOTE: Wiring diagram shows DCDI ignition.

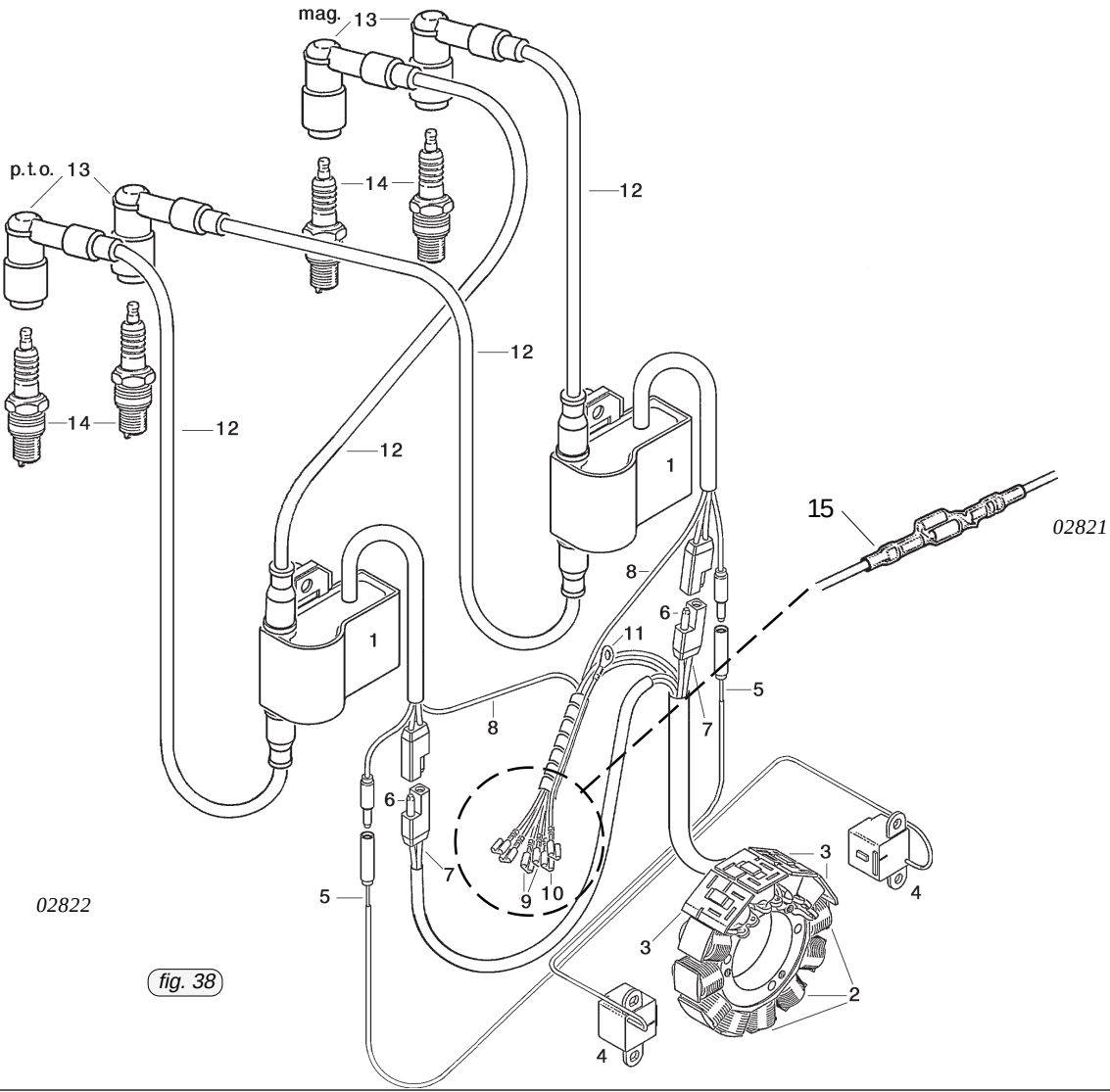


fig. 38

18.4) Lighting circuit:

In the stator 8 lighting coils are incorporated. The output is 170W A.C. at 6000 l/min. This alternating current can be used directly to feed A.C. consumers, or via a rectifier-regulator for loading a battery and feeding direct current consumers.

To avoid the voltage to rise above permissible levels, a voltage regulator must be used.

To operate loads requiring direct current (e.g. charging battery), a rectifier-regulator is required.

A rectifier-regulator, part no. 866 080, is available. As a power supply for lights only. This rectifier-regulator can be used without a battery. In this case the regulated RMS voltage will be between 11 and 12 Volts as long as a minimum load of 1 amp is provided.

If a battery is used it must be capable of absorbing approx. 1 amp. minimum continuous charging load, even with full charge (suggested minimum battery capacity: 9 amp.h, resp. 16 amp.h with electric starter). Regulated voltage is 13.5 to 14.5 volts.

When using 3-phase rectifier-regulator 264 870 no minimum load is required.

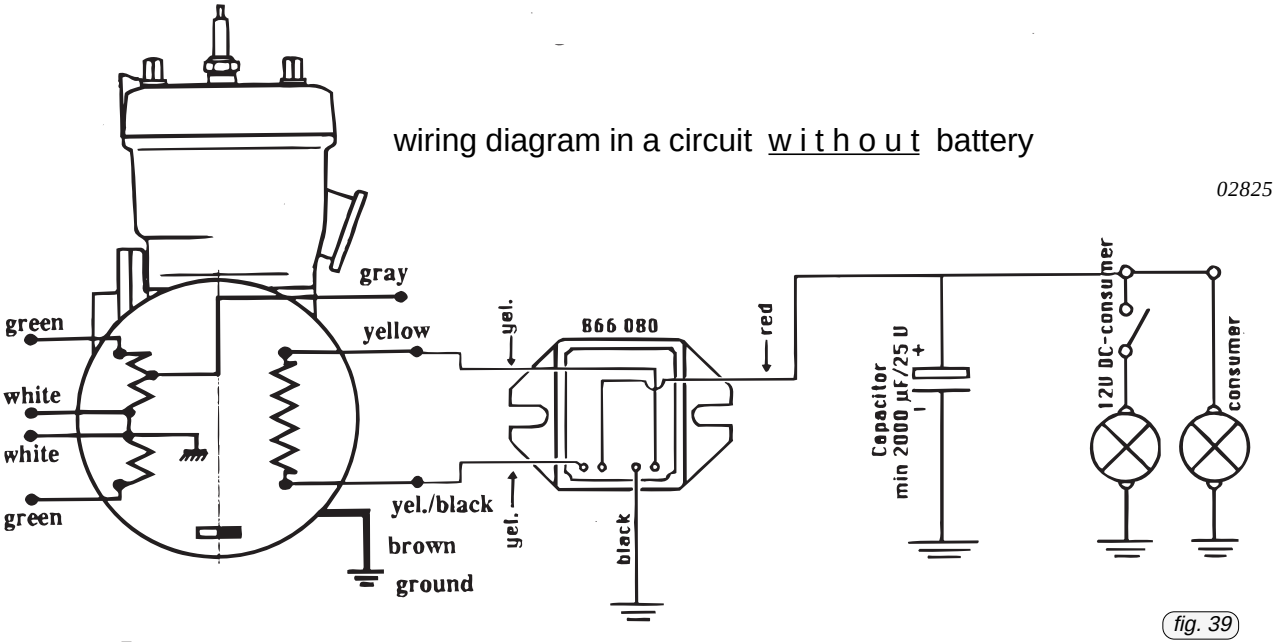
18.5) Technical Data and connection of components

18.5.1) Wiring diagram for rectifier regulator 866 080

■ Attention: To avoid excessive voltage in conjunction with the rectifier regulator 866080, a constant minimum ballast load of 1 amp is required (example: lamp 12 V 15 W).

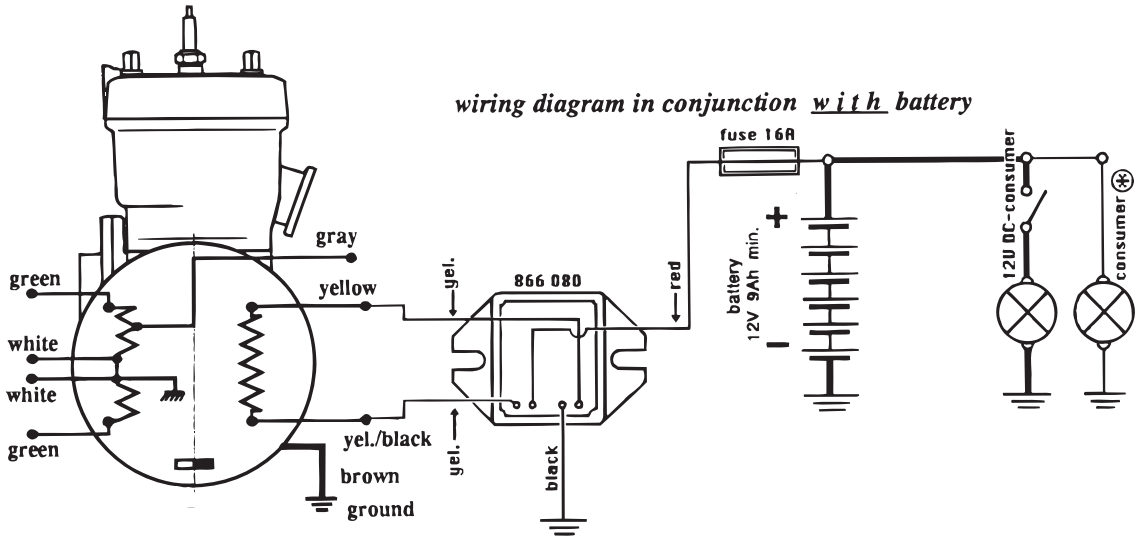
wiring diagram in a circuit w i t h o u t battery

02825



d00328

fig. 39



02824

fig. 40

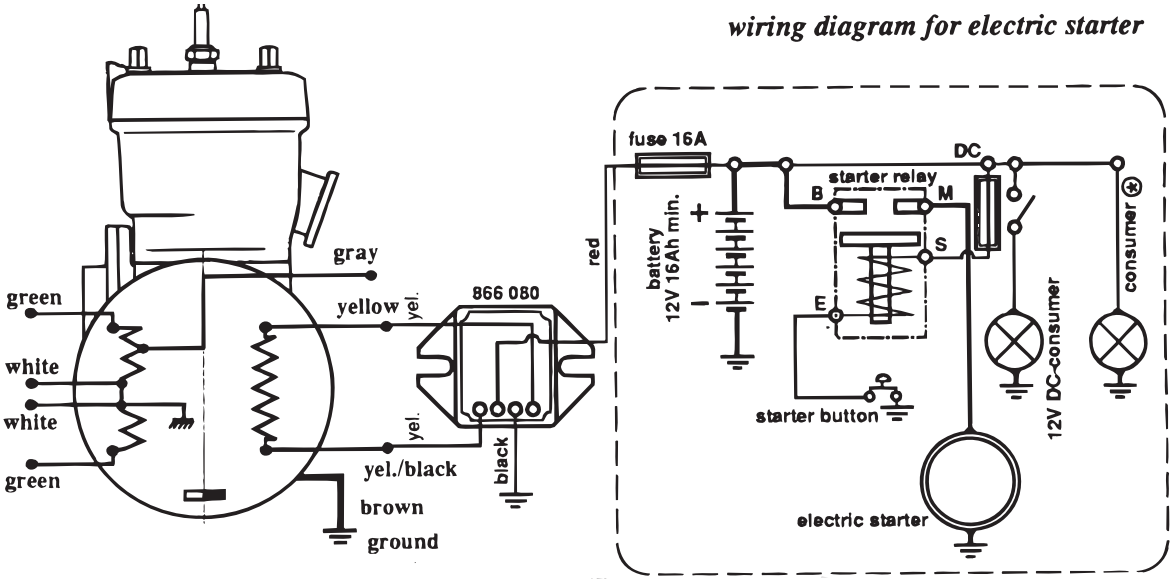


fig. 41

02823

d00328

18.5.2) Wiring diagram for rectifier regulator 264 870

(not limited to minimum of 1 Ampere consumption)

wiring diagram in a circuit w i t h o u t battery

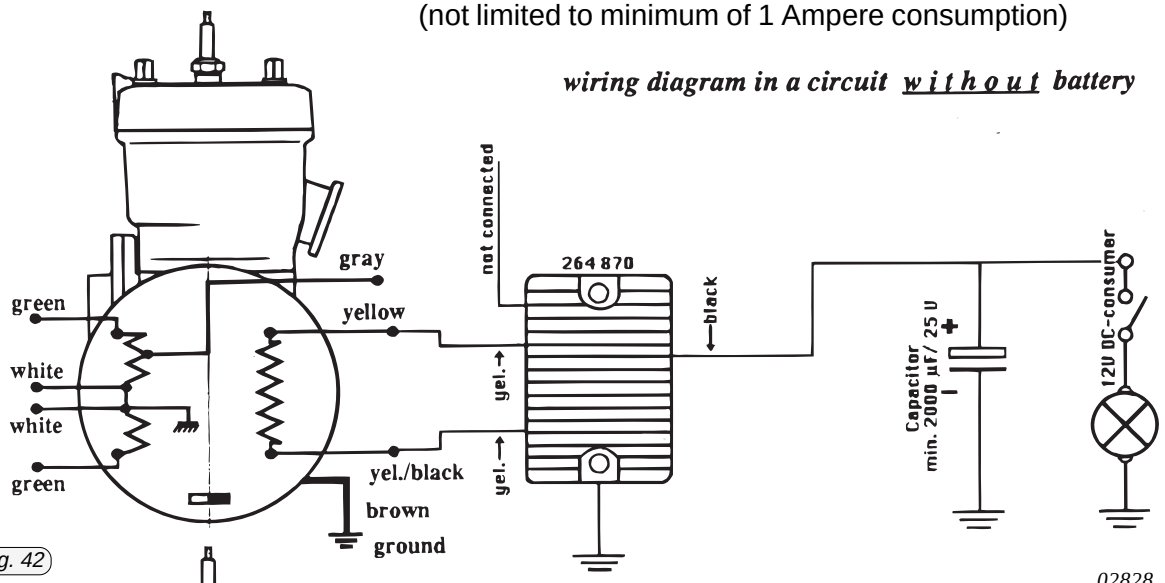


fig. 42

02828

wiring diagram in conjunction w i t h a battery

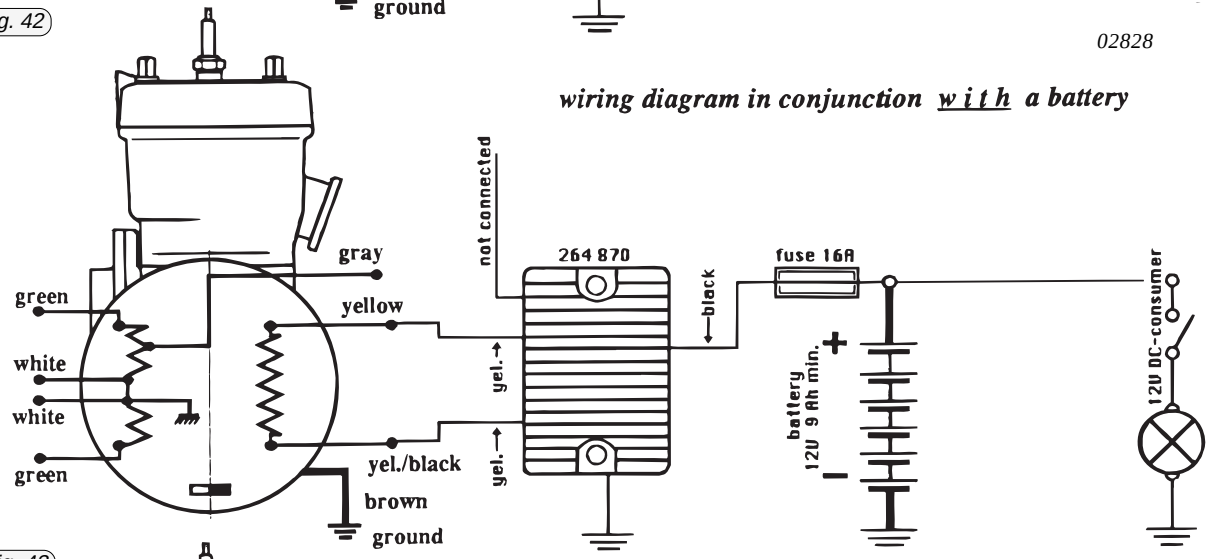


fig. 43

02827

wiring diagram for electric starter

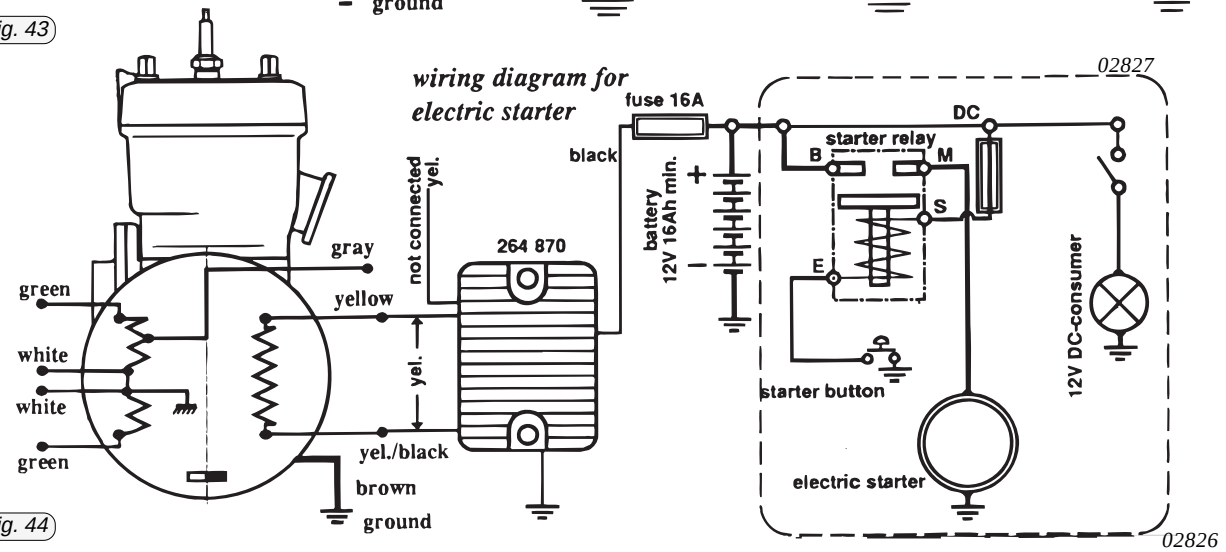


fig. 44

02826

d00328

18.5.3) Electronic revolution counter:

The revolution counter, part no. 966 404, has been specifically designed to be connected to the 12 pole flywheel generator used on the Ducati CDI Systems.

The revolution counter measures the frequency of the pulses provided by one of the transducers supply winding where it is connected. It does not require any external power supply. It is connected by two wires without polarity.

The indicating range is up to 8000 r.p.m. The weight is 235 gram.

Connection to dual ignition system:

02960

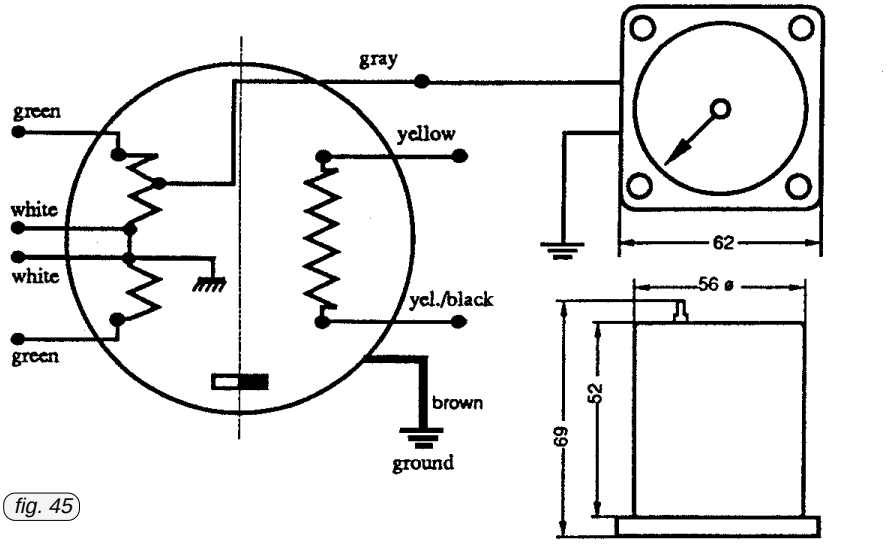


fig. 45

The generator integrated in the DUCATI dual ignition has a special gray cable for revolution counter connection. The revolution counter 966 404 must be fitted between the gray cable and mass (brown cable).

The tachometer will indicate correct RPM even if one of the two ignition systems is turned off for ignition testing procedure or a transducer failure occurs.

Maximum allowed deviation: +/- 100 1/min

d00328

18.5.4) Electric starter

Two types of electric starters can be fitted to ease starting procedures especially in flight.

Electric starter fitted on “E” type gearbox. There is also the possibility to use a rewind start.

Electric starter fitted on magneto side. However for use on engines utilizing a ROTAX gear reduction unit, this electric starter system prevents rewind starter application.

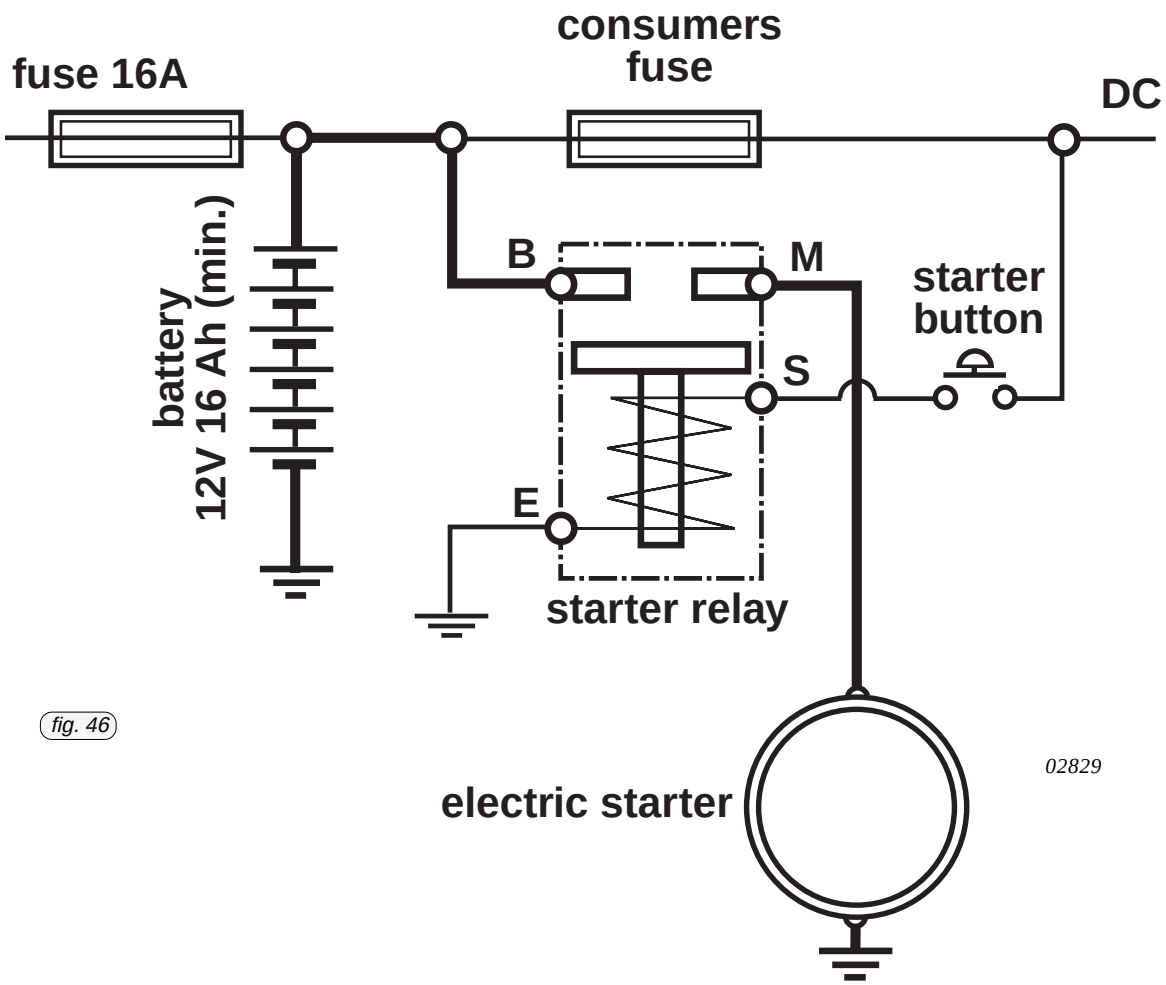


fig. 46

d00328

Battery:

To ensure reliable starting, a battery of least 16 Ah (high-discharge battery) must be utilized. A higher battery amp-hour-rate would be preferable. Cables supplying power to the starter from the battery and to ground should be a minimum 10 mm^2 flexible multi-strand cable.

Power source:

from rectifier regulator

Starter relay (992 819)

Starter control should be via starter relay (supplied with starter kit) wired as shown above.

Fuse

A 16 Amp fuse must be installed between battery charging circuit and main power terminal.

d00328

19) Propeller drive

▲ WARNING: Never run the engine without a propeller installed as engine would suffer severe damage by overspeeding.

Never fit propeller directly on crankshaft.

Normally, the propeller gearbox will be supplied and installed on the engine. If the gearbox is delivered seperately take note of the gearbox installation instructions in chapter 14).

19.1) Technical data:

- direction of rotation of the prop flange: clockwise, looking towards face of flange.

19.1.1) "B" type gearbox

Reduction ratio: 2,0 / 2,24 / 2,58
Attachment holes on propeller flange

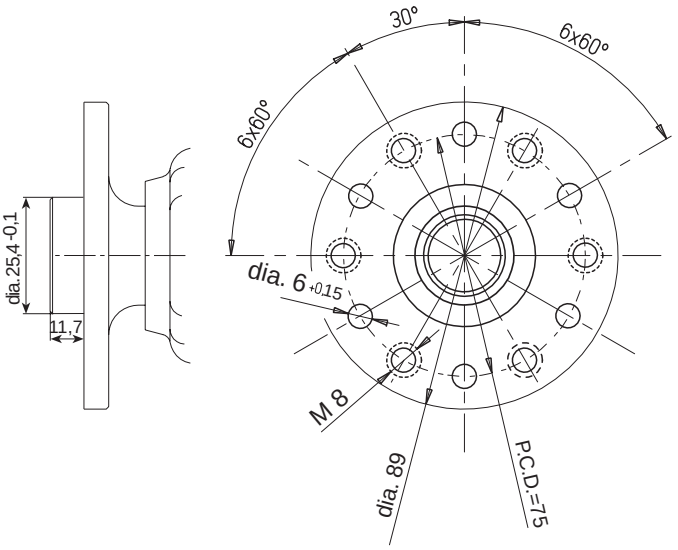


fig. 47

02840

d00329

19.1.2.) **"C"** (CL) **- and "E"** (EL) **type gearbox**

Reduction ratio: 2,62 / 3,0 / 3,47 / 4,0

Attachment holes of propeller flange

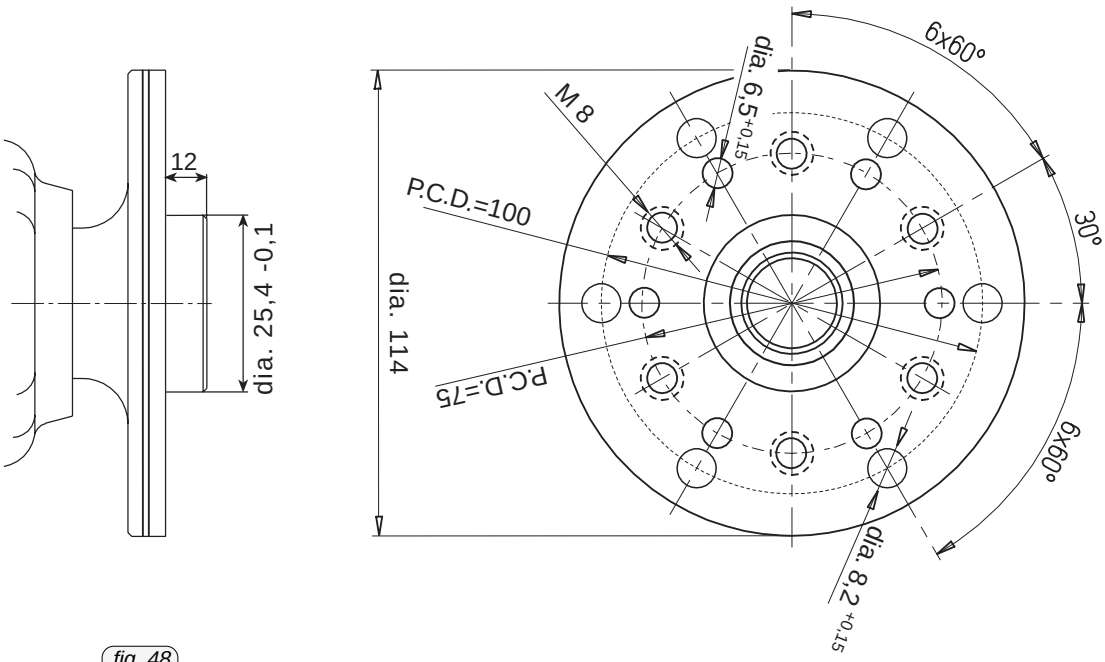


fig. 48

02841

d00329

20.) Connections for instrumentation

20.1) Sensor for cylinder head temperature (spark plug seat temperature)

- location and connection ..... one each per cylinder fastened by one spark plug.

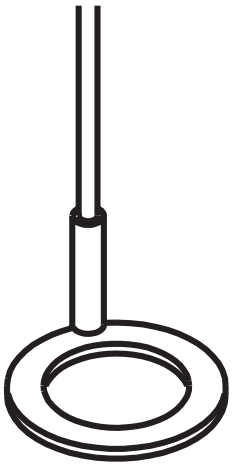


fig. 49

Tightening Torque of spark plug: 15 Nm (133 in.lB.)

01005

20.2) Air and coolant sensor

location and connection coolant: only at 582 UL DCDI and 582 UL DCDI mod. 99 on cylinderhead

Air: ..... location free to choose

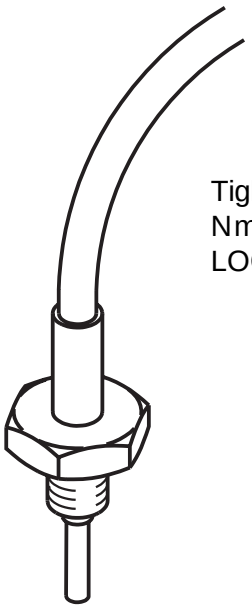


fig. 50

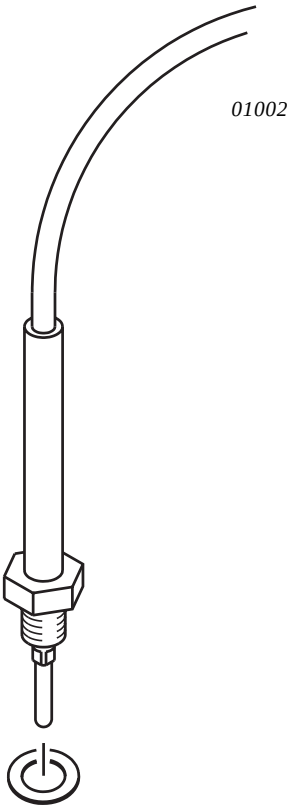
Tightening Torque: 6 Nm (53 in.lB.) + LOCTITE Anti Seize

01004

d00330

20.3) Exhaust gas temperature sensor

location and connection ..... Exhaust manifold assy



Tightening Torque:
20 Nm (177 in.lB.) +
LOCTITE Anti Seize

fig. 51

d00330

20.4) Installation plan for the sensors on 582 UL DCDI and 582 UL DCDI mod. 99

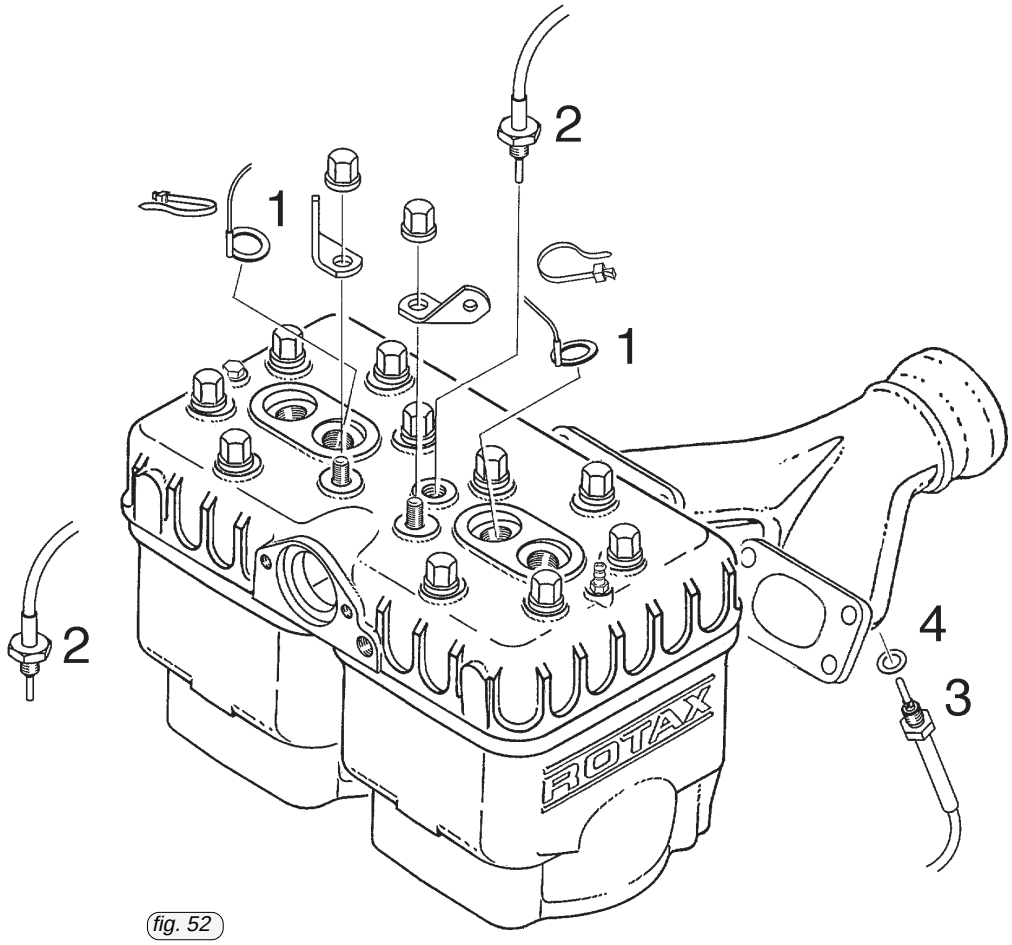


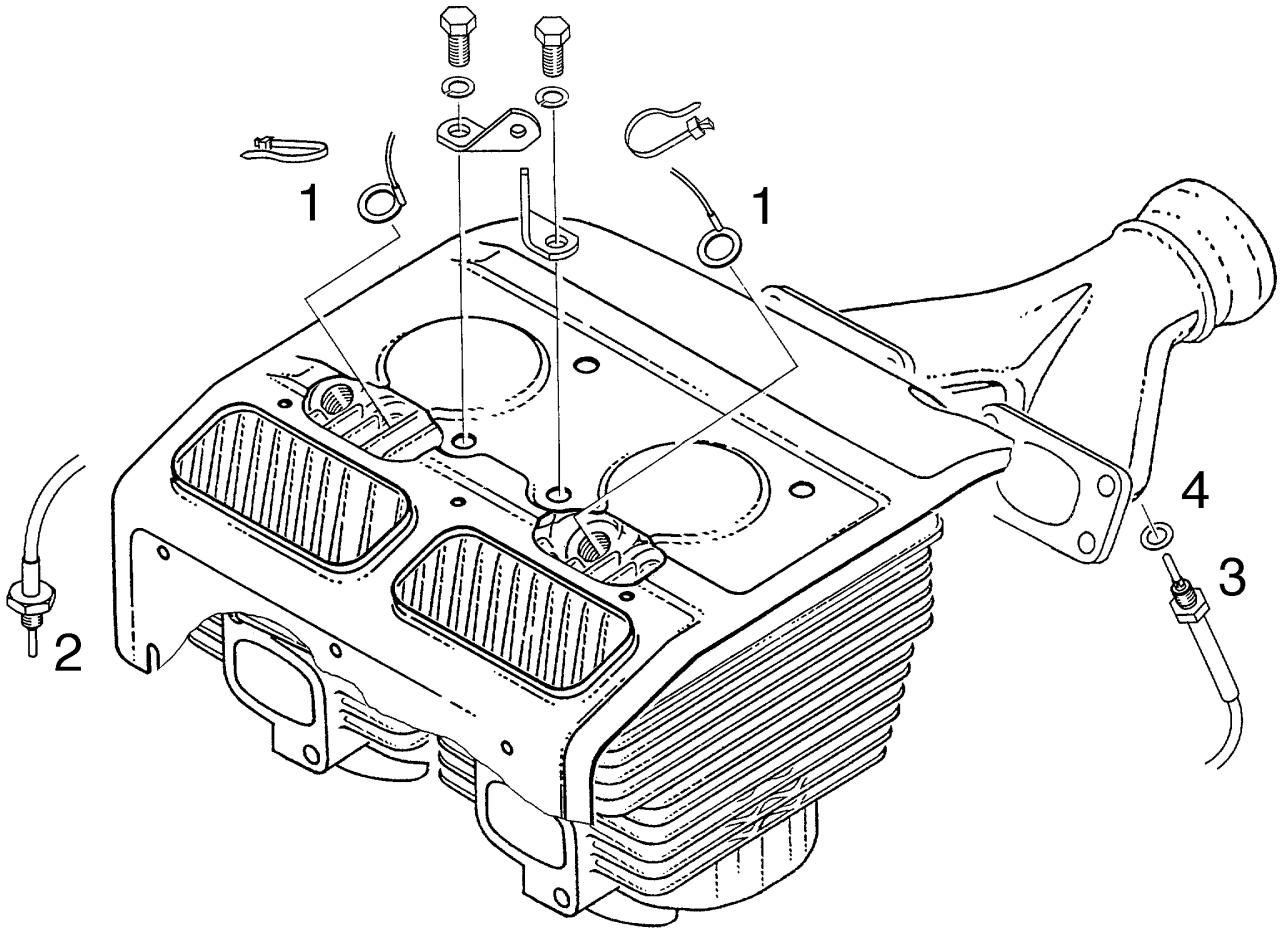
fig. 52
01008

1) Sensor at spark plug seat (CHT)
2) Air- and liquid temperature sensor
3) EGT- sensor
4) Sealing ring

d00330

20.5) Installation plan for the sensors on 447 UL SCDI, 503 UL DCDI

1) Sensor at spark plug seat (CHT)
2) Air- and liquid temperature sensor
3) EGT- sensor
4) Sealing ring



d00330

21) Break-in procedure

for aircraft installation (in other applications proceed accordingly)

The break-in must be performed with the engine installed, and properly loaded with matched propeller for max. R.P.M. In case of an aircraft, anchor the fuselage to the ground. Run the engine according to the following graph:

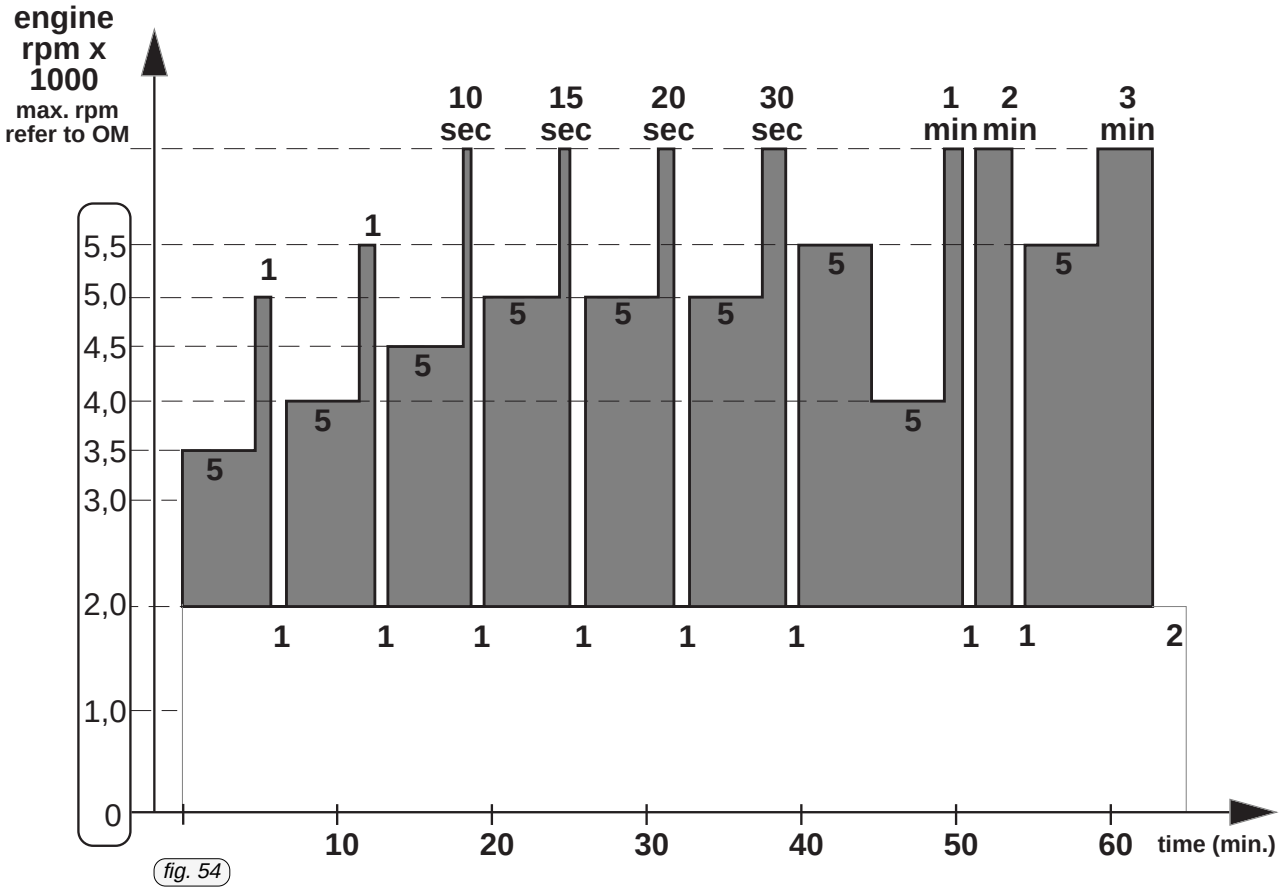


fig. 54

02854

On a liquid cooled engine it is possible that the cooling air flow (speed) on ground is not enough to provide adequate cooling for extended periods of time. Therefore, it is necessary to observe carefully the temperature of the cooling liquid during break-in procedure to avoid overheating. Before exceeding the maximum allowed cooling temperature on cylinder head (outlet) of 80 °C/180 °F interrupt the run-in and cool down the engine at idle for approximately one minute and continue the run from where it was interrupted.

On a free air engine it is possible that the cooling air flow on ground is not enough to provide the necessary cooling for extended periods of time. Therefore, it is necessary to observe carefully the cylinder head temperature (CHT) during the break-in procedure and avoid overheating. Before exceeding the maximum allowed **CHT of 250 °C / 480 °F** interrupt the run and cool down the engine at idle for approximately one minute and continue the run from where it was interrupted.

d00331

Be sure to use a safe run-up area, to anchor aircraft at those points approved by the airframe manufacturer, and to have someone present who is able to shut off the engine instantly and to prevent unauthorized people entering the danger area.

Proper clothing, ear protection etc. should be used on any engine run-up test.

After this procedure the idle must be adjusted (see also latest revision of the current Maintenance Manual 447-503-582). Then proceed with taxi test to verify proper cooling system. Then short take offs can be conducted. After a few short full-load take-offs, but not later than after 2 hours total running time, the cylinder head nuts must be re-torqued to 22 Nm (195 in.lb.). For this procedure the cylinder cowl (if any) must be taken off.

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